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MAR 1 1915

FISCHER SWEENY BRONZE COMPANY
VACUUM HEATING SYSTEMS

CATALOGUE B-14

FISCHER SWEENY BRONZE COMPANY
VACUUM HEATING SYSTEMS

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Vacuum Heating Appliances

AIR LINE AND RETURN LINE SYSTEMS
OF
VACUUM HEATING

HOME OFFICE, FACTORY AND FOUNDRY:
CLINTON, THIRTEENTH AND GRAND STS.
HOBOKEN, N. J.

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Guarantee

These products are sold with the plain understanding between the purchaser or his agent, and ourselves or our agents, that:—

They are unconditionally guaranteed to be free from all defects in material and workmanship; to be correct in mechanical principle; and furthermore, to efficiently accomplish the work for which they are specified as described in these pages, provided that our simple installation instructions are carefully observed.

We hereby agree to promptly repair or replace any apparatus or part thereof free of charge, that proves defective or fails in any manner to perform the duties for which it was designed as described within these pages.

This guarantee does not apply to a heating system containing vacuum heating apparatus made by other manufacturers, unless such apparatus meets with our written approval.

PREFACE

WE take pleasure in presenting in the following pages an article written for us by Professor Carpenter of Cornell University on the comparative merits of vacuum heating.

Our object in presenting this article is to give a true and unexaggerated account of this principle of heating by a disinterested and acknowledged authority whose words are based upon years of scientific research.

The proper heating of a building is a factor of prime importance and should receive careful attention by all those intending to build or renovate.

To a large degree it determines whether a building is economically or extravagantly operated, whether living conditions are comfortable and healthy or uncomfortable and unhealthy for practically the greater part of the year, year in and year out, during the life of a building.

The purpose of this book is but to mention the essential appurtenances of vacuum heating systems to an extent that will give the reader an understanding of the devices that are utilized and their functions, together with their relationship, one to another, as a system.

There are many other factors to be considered in connection with the layout of a heating system, which, in a large measure, are contingent upon specific local conditions.

In details of construction heating plants are, to the extent of their particular conditions and requirements, dissimilar and should more properly be dealt with only when the conditions and requirements of a particular heating system are to be considered.

To be right in the first place is the wiser course. If you contemplate building or renovating we solicit your inquiry concerning your heating problem. Any information or suggestions concerning the system and apparatus best suited to your particular requirements will be gladly given upon request.

HEATING SYSTEMS

HEATING systems are divided into three general classes, according to the medium by which the heat is conveyed, namely— Hot Air, Hot Water, and Steam. Each method of heating has its advantages and disadvantages which will be briefly enumerated.

AIR

The use of hot air with natural circulation is practically limited to small residence heating, because of its uncertainty in larger installations on account of friction in the ducts retarding or preventing the flow of the heated air. Even at its best this system is objectionable, because of the effect upon the air within the rooms due to dehumidification, furthermore dirt and dust are constantly being carried by the heated air into the rooms, also furnace gases often accompany it.

WATER

Hot water heating has gained popularity because of its ability to maintain a uniform temperature in the room to be heated due to its large mass. By simply adjusting the fire, any required temperature of water in the radiators may be obtained. This system has many disadvantages, however, as follows:—

1. Greater radiation than in steam heating because of much lower temperature, meaning, of course, larger and more expensive radiators.

2. Double piping because of the necessity of a complete circuit for flow to take place, requiring twice the amount of pipe necessary for a single pipe system of steam heating.

3. Larger piping, so that the flow of water will not be too materially restricted by friction; a small increase in pipe size is decidedly expensive.

4. Considerable time in heating up the system because of the great mass involved.

5. System not applicable to large installations because of a limit to the distance the water will circulate and give results, unless forced circulation is employed.

6. Liability of serious damage due to leakage, which might be caused by freezing or imperfections in the fittings and piping, which are under a constant strain of approximately 2.3 pounds pressure per square inch for every foot of elevation.

STEAM

Low pressure steam heating permits the use of smaller radiators and smaller piping than hot water heating, and does not necessarily require a separate return pipe; but in moderate weather this method proves uneconomical as well as uncomfortable. In order to get any heat to the radiators, it is necessary to "keep up steam," the temperature of which in the system under consideration, cannot be less than about 212 degrees when it reaches the radiators. The result is that if the rooms overheat, windows must be opened, and the radiator valves closed until the temperature drops, causing annoyance and unhealthful conditions. When the fire is banked at night, the radiators cool off rapidly. In the morning, considerable time elapses after the fire is started before steam comes up. Usually it is accompanied by cracking sounds or water hammer, and the disagreeable odors escaping through the air valves, often with an irritating noise, are unhealthful.

THE VACUUM SYSTEM of steam heating is now recognized by the leading architects and engineers as the ideal system, in that it combines the advantages and eliminates the disadvantages of the systems previously mentioned. There are various types listed on the market, differing principally in the patented appliances for the removal of air and water of condensation; but there are two general classifications, namely,—(1) Air line, or one pipe system; and (2) Return line, or two pipe system.

THE ONE PIPE SYSTEM

Commonly known as the Paul System, consists of an ordinary single pipe steam heating plant with the addition of automatic air valves with pipe connections to a vacuum pump or ejector for mechanically removing the air from the system. The size of pipe for the air line may be as small as ¼ inch at the radiator, but should be increased to ½ to ¾ inches for the risers, and again to 1 or 1¼ inches for the main. It is well to have the air line pipe of ample size, as there is but little difference in cost and the larger sizes are less likely to have defects or to become clogged by dirt, oxidation, or otherwise. Provided that galvanized fittings are used, air line mains and all joints tight, piping properly graded, steam mains of proper size and properly proportioned, air valves of proven efficiency used, and reasonable pains taken to avoid traps or water seals in horizontal steam connections to radiators, this system will generally give entirely satisfactory results and effect an economy in fuel that will well warrant its installation as experience has shown.

Several tests have been made with the Paul System against the ordinary low pressure steam heating system, the results of which show the vacuum system to be superior in every way. In Volume V of the Transactions of the American Society of Heating and Ventilating Engineers, Professor J. H. Kinealy of Washington University reports on tests made at St. Louis and at Washington in which it was found to be more economical to heat with steam at a temperature less than 212 degrees than it is to heat with steam at a temperature greater than 212 degrees. The St. Louis tests showed an economy of 10 per cent. in steam consumption per degree difference of steam temperature and room temperature for atmospheric pressure, against a pressure of five pounds, and a proportionately greater economy for pressures less than atmospheric. The Washington tests showed even greater economy than above, 20 to 25 per cent. more steam being used at the higher pressure than at the lower pressure.

More extensive tests were made on a Paul System by Professor Carpenter at Cornell University, the results of which were much in favor of the vacuum system. The records of the tests are not available, however, so that the actual figures can not be presented.

The advantages of this system depend principally upon the quick removal of air from the various radiators and pipes, which constitutes the principal obstruction to circulation. When steam is circulated in the ordinary manner at pressures above the atmosphere, the air in the system must be forced out by the steam, and as a consequence the loops of the radiators are slow in heating up. Frequently they become air bound or short circuited, seriously cutting down the effective radiating surface.

Vacuum systems are especially adaptable where exhaust steam may be utilized for heating. A large percentage of the original heat in the steam passes out of the engine as latent heat and is given up by condensation. If this steam is condensed in a heating system before being returned to the boilers, a considerable saving in fuel results.

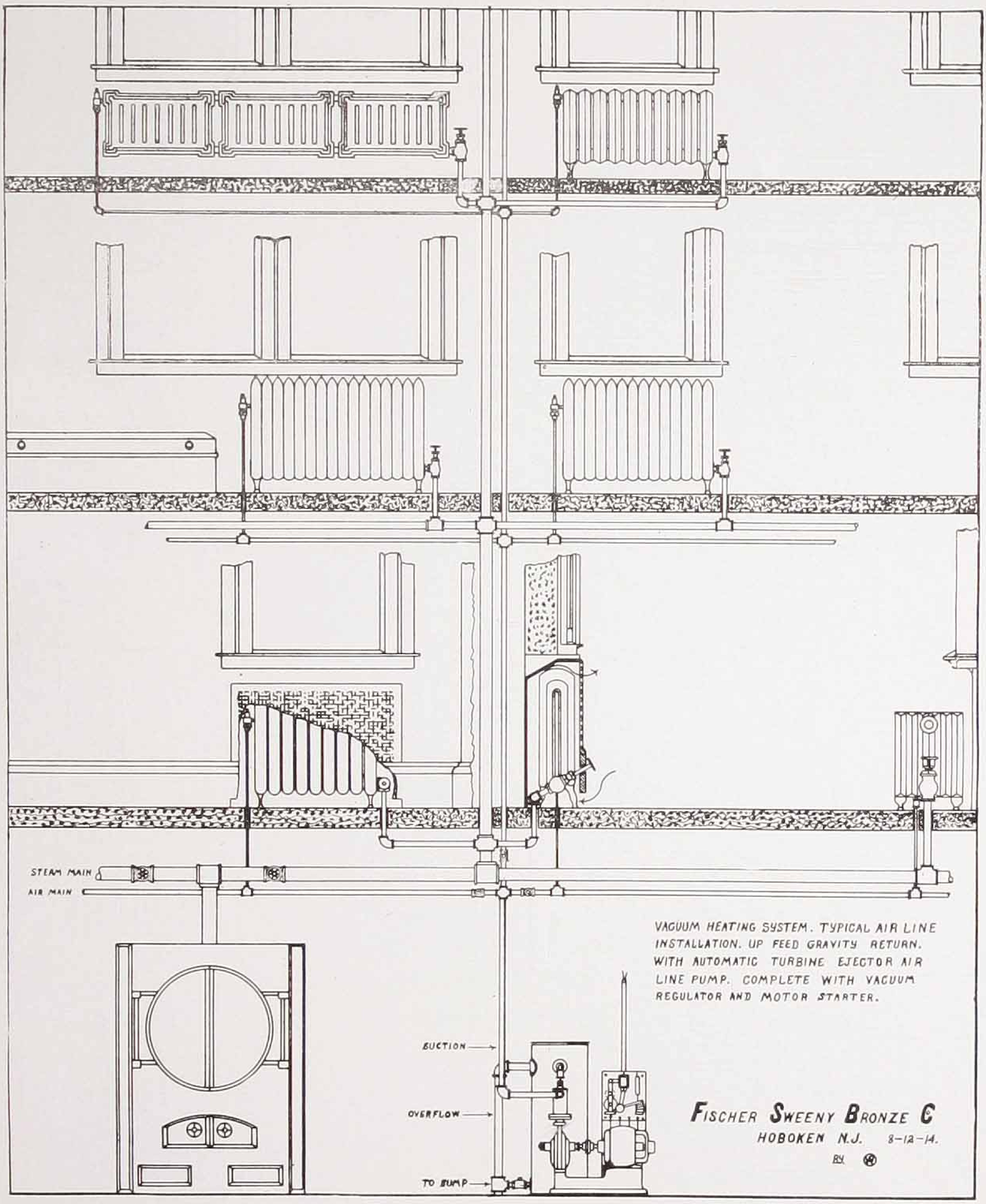
THE TWO PIPE SYSTEM

With this, the return line vacuum system, a thermostatic or other type of valve is connected at the bottom of the radiator, at the end opposite the entering steam, for the purpose of passing the air and water of condensation without permitting steam to escape. The air and water are carried down the return line piping, usually to a receiving tank where the air is removed, and the water of condensation returned to the boiler. By using a modulating valve in conjunction with this system, the temperature can be quickly controlled at will; or by the use of an automatic thermostatic control, any predetermined temperature can be maintained continuously. With this system there is no tendency for water seals to occur, as the vacuum pump will circulate through the thermostatic valve any condensation that otherwise has a tendency to form a seal and prevent the free and easy flow of steam or vapor to a radiator.

Otherwise than the power to independently modulate the temperature in any part of the heating system and more perfect drainage, a two pipe system is in its operation and economy greatly similar to a one pipe system.

There are several vacuum and vapor systems that might be mentioned, which by devious methods and devices undertake to obtain these results without mechanical means; but, for the most part, they are complicated and sooner or later prove unsatisfactory. Where no "positive" means are utilized, the vacuum is usually quickly destroyed through leaky supply or air valves, fittings, etc., and this infilteration of air is responsible for the loss of efficiency and inability of such systems to give general and lasting satisfaction. Time and experience has conclusively proven that it is only by the use of simple, positive, mechanical means of obtaining and maintaining circulation that reliable and satisfactory results are achieved. Where mechanical means are not employed the necessary energy to expel the air is obtained from steam pressure, which means waste of fuel and loss of time.

R. C. Carpenter



VACUUM HEATING SYSTEM. TYPICAL AIR LINE INSTALLATION. UP FEED GRAVITY RETURN. WITH AUTOMATIC TURBINE EJECTOR AIR LINE PUMP. COMPLETE WITH VACUUM REGULATOR AND MOTOR STARTER.

Typical Plan of the

F. S. B. PAUL AIR-LINE VACUUM SYSTEM

With the Type W. H. Turbine Ejector Pump

DESCRIPTION

S. F. B. "PAUL" AIR LINE SYSTEM

This system consists of our Type WH TURBINE EJECTOR PUMP, Type AW Water Exhauster, or Type OS Paul Steam Exhauster of which we are and have been the sole manufacturers. The type of building to be heated, the particular requirements and conditions would determine which of the three above air exhausting devices would be used. A complete description of each one of these devices will be seen in the following pages.

Experience has conclusively proven that it is a serious mistake to install an air line system without the use of a positive air exhausting device.

When such a system is installed with the air line terminating into the flue or sump, it is only a matter of time when the air line piping will become clogged with dirt at the elbows and fittings. Such a condition is by no means easy to overcome. Many notable buildings correct and modern in other principles of construction, have suffered this fate, with the result that it has been necessary to break the air line connection and resort to ordinary automatic air valves, which of course means the necessary acceptance of a system inferior in economy, efficiency, and comfort, all of which might just as well have been avoided in the first place.

The "Gotham" air valve manufactured expressly for our use with this system is one that years of service has proven to be of exceptional merit. This valve has been in successful operation in many large New York City buildings for over fifteen years. In operation it has proved to be one that will last indefinitely, that will not become clogged with dirt, and furthermore the thermostatic member will not buckle or lose its elasticity.

This valve is of the lock shield type, and cannot be tampered with. By merely inserting a key held by the person in charge, it can be quickly adjusted by a slight turn. This is a great step in advance of all others where it is necessary to disconnect the union, or use a wrench and screw driver to remove caps, etc., to get at the adjustment. It will be described further on.

When exhaust steam heating is used we provide oil separators, and also, if necessary to introduce live steam into the system, a pressure reducing valve is provided.

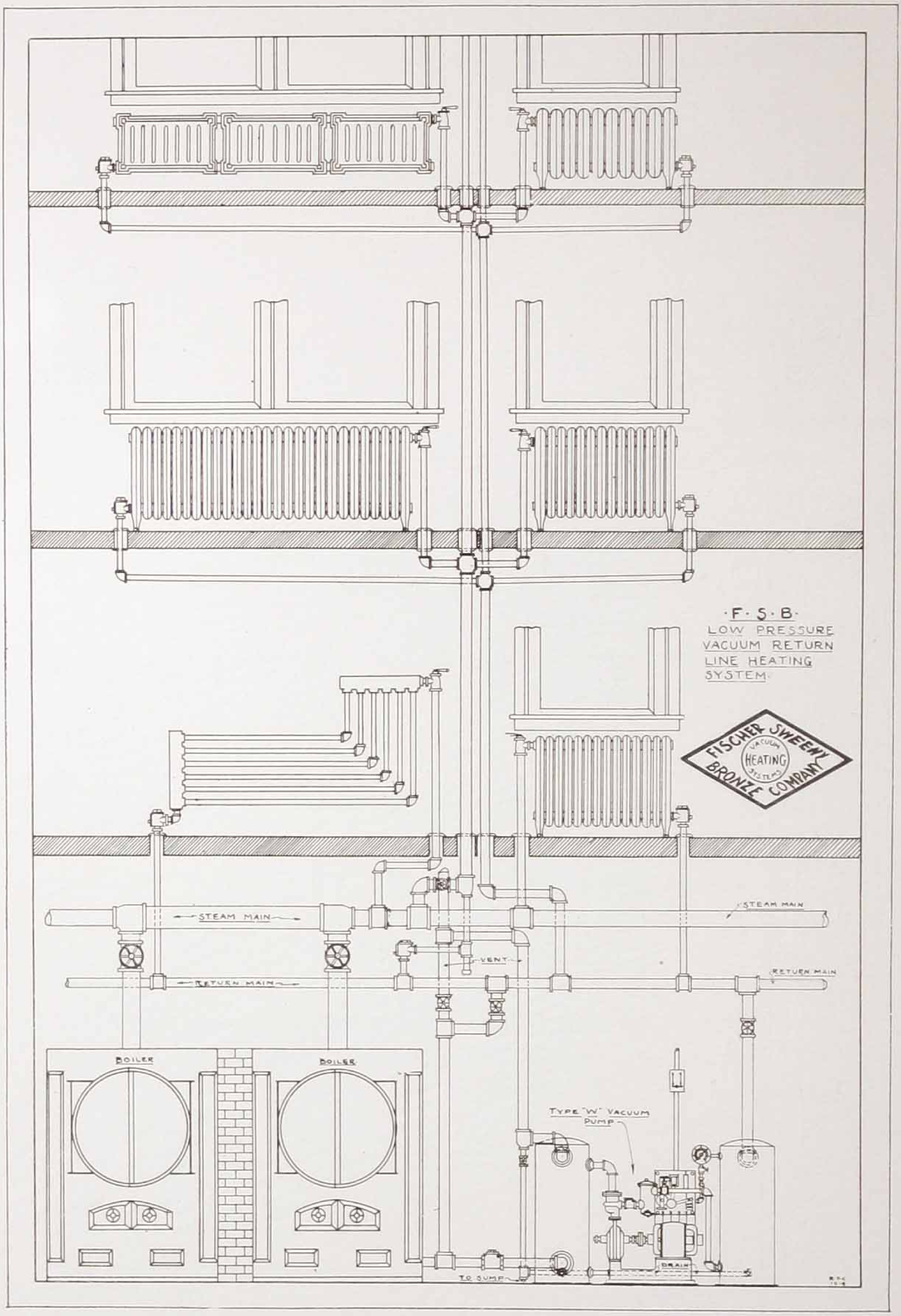
In large buildings if desired, it is possible by the use of this system of vacuum heating to make a reduction in the sizes of the supply piping that will effect a material reduction in the installation cost.

In all buildings where economy of installation is a consideration of importance, the **F. S. B. Paul System** will be found best suited to the requirements. Its simplicity and effectiveness has proven this system as outlined to be ideal for use in dwellings, churches, office buildings, factories, public buildings, theatres, hotels, and is also applicable to all kinds and forms of apparatus for heating or drying.

To be brief, we reiterate some of the advantages of this system as set forth in a booklet issued by us several years ago.

1. "A positive and uniform circulation of steam without pressure above that of the atmosphere."
2. "Utilizing the heat of steam at low temperatures, thereby gaining great economy."
3. "Warming without impairing the quality of the air within the rooms."
4. "The independent and automatic removal of the air from the heating apparatus."
5. "A sealed system, no leakage, no odor or dripping from air valves."
6. "All heating surface is held in the best condition to operate promptly when desired, and all parts of the surface are rendered uniformly efficient when steam is turned on."
7. "Exhaust steam utilized without back pressure at engine or pump."
8. "Water of condensation returned quickly and economically at highest temperatures."
9. "Less steam used, less coal burned to heat a given space."
10. Rapidity and silence with which heat is obtained.
11. Use of but a single pipe for the supply of steam and return of the water of condensation.

FISCHER SWEENY BRONZE COMPANY
VACUUM HEATING SYSTEMS



Typical Plan of the
F. S. B. LOW PRESSURE RETURN LINE HEATING SYSTEM

DESCRIPTION

F. S. B. RETURN LINE SYSTEM

Our TURBINE EJECTOR PUMP Type W described in the following pages is used in conjunction with this system. The pump constantly drains the system of all water of condensation and automatically expels the air. It automatically maintains a vacuum upon the system within any predetermined range, and returns the condensation direct to the boiler in low pressure plants.

The B. V. M. Thermostatic Valve manufactured by us and hereinafter described is attached to the return end of a radiator or coil. This valve constantly and automatically keeps the radiator drained of all condensation and air. It also is so constructed that it acts as a check valve, which of course effectively prevents air and condensation from re-entering a radiator after having once been expelled; this feature is peculiar only to this thermostatic valve.

Modulating Valves regulating the quantity of steam at the point of admission to a radiator are also supplied. This makes it possible to regulate the amount of heat in a room in a most easy and convenient way.

If required, oil separators, and pressure reducing valves are provided.

This type of vacuum heating has met with considerable popularity.

To be brief, a return line system is in many essentials of operation and economy similar to an air line system. Instead of the water of condensation flowing back through the steam supply piping it is carried off by an independent system of piping and returned by gravity or mechanical means to the boiler. In addition the inlet valve of a radiator is amenable to modulation.

The features of the return line system are as follows:—

1. Absence of back pressure on motive engines when exhaust steam is utilized.

2. A perfect drainage of supply pipe systems preliminary to an equally perfect drainage of radiating surface without the loss of steam.

3. A continuous automatic drainage of condensation and the prevention of any accumulations of water.

4. A positive and consequently effective steam circulation.

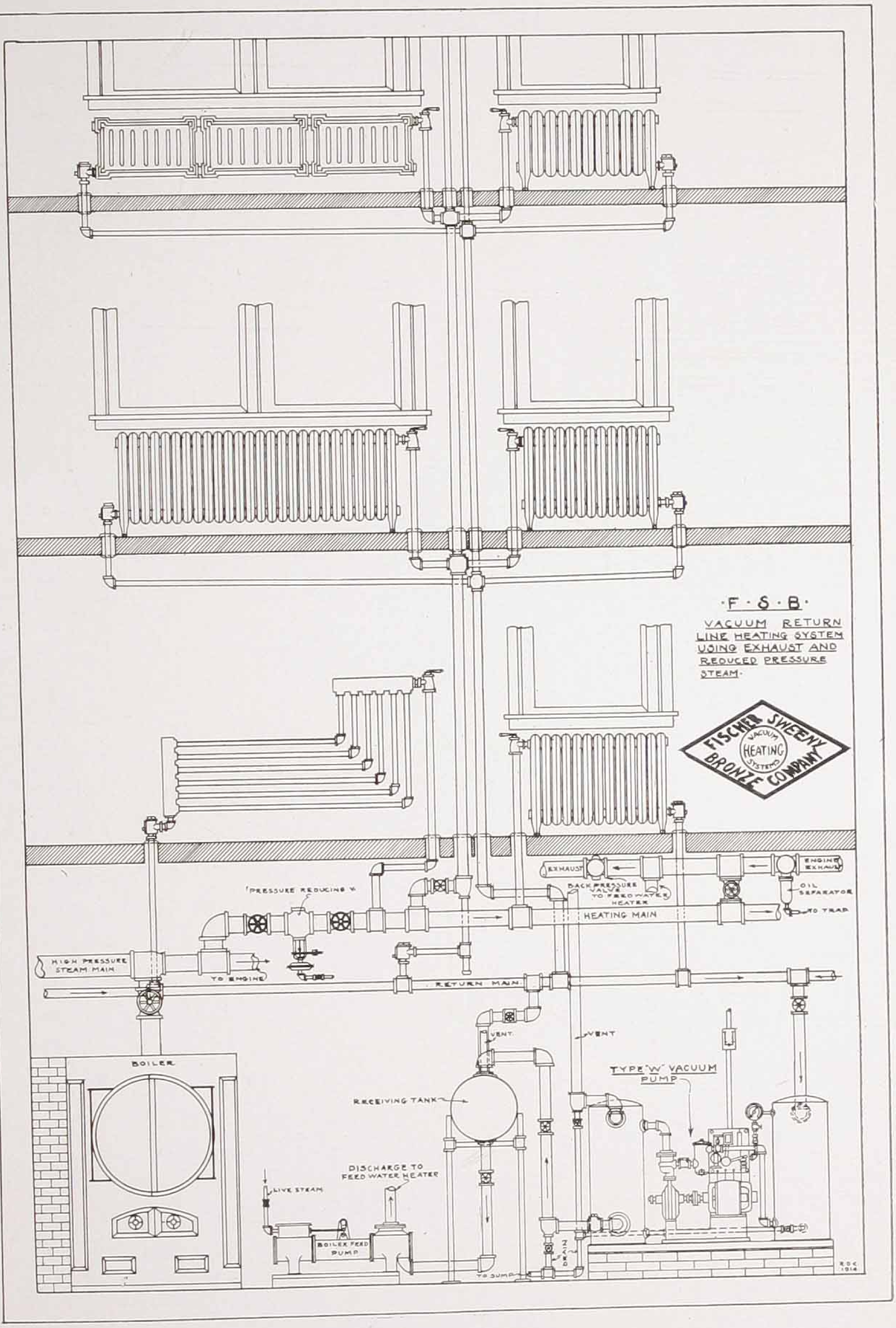
5. Perfect control of circulation with power to vary it at will.

6. Removal of air and gases from heating surfaces and feed water.

7. Power to independently modulate temperature in any part of the heating surface.

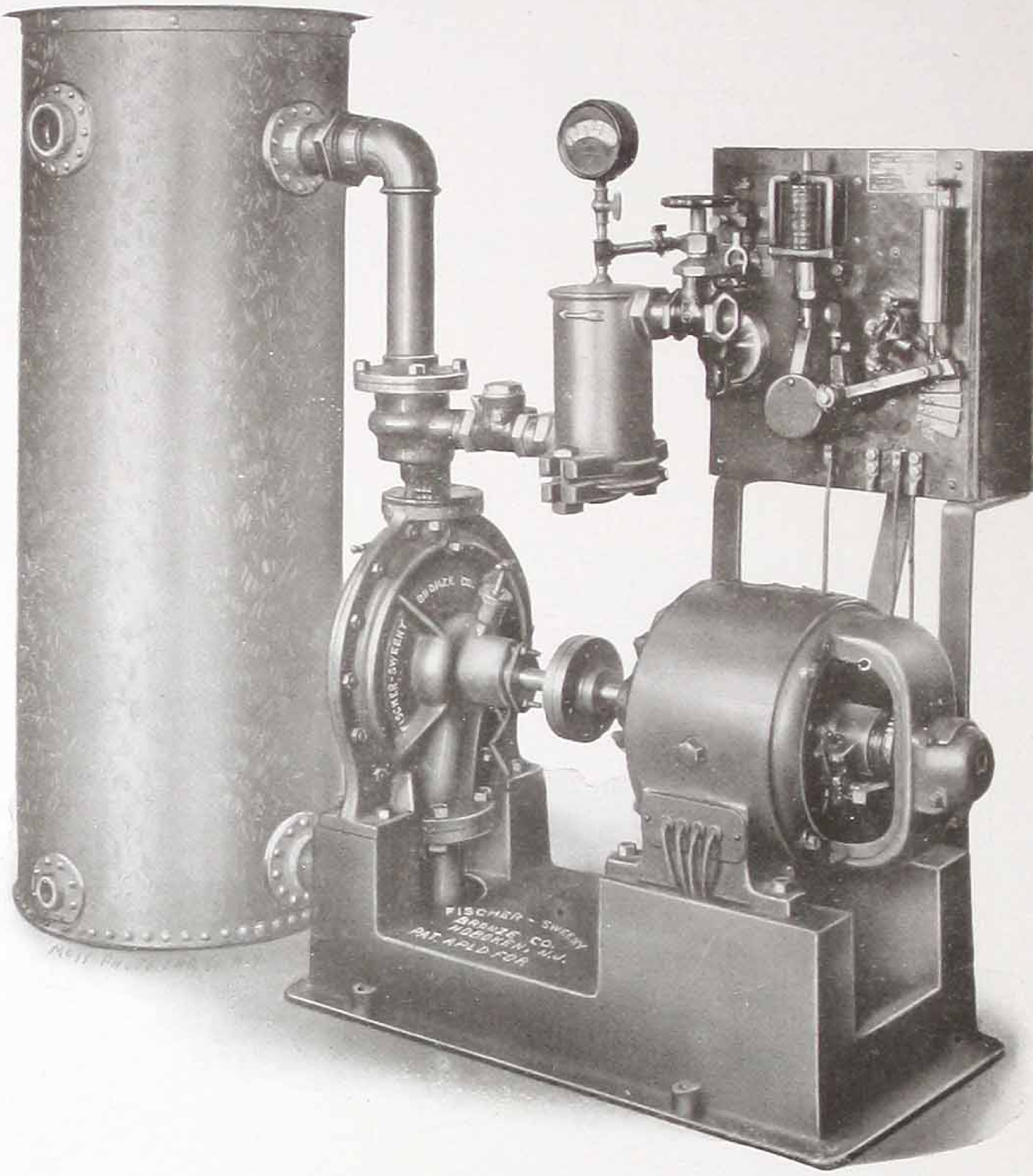
8. The return of condensation from points somewhat below the line of drip or drainage mains when necessary.

9. Smaller pipes may be used than with the ordinary low pressure two pipe system, because of the action of the vacuum pump creating a rapid flow. The supply pipes may be made one or two pipe sizes smaller with the vacuum system, and the returns two or three sizes smaller than would be used with the ordinary low pressure system.



Typical Plan of the

F. S. B. EXHAUST STEAM RETURN LINE SYSTEM



FISCHER-SWEENY BRONZE CO.
FISCHER-SWEENY BRONZE CO. HOBOKEN, N.J. PAT. APLD. FOR

TYPE W. H.

TURBINE EJECTOR PUMP

Patented August 25, 1914

AUTOMATIC OPERATION

EQUIPPED WITH RESISTANCE STARTER

FOR

AIR LINE SYSTEMS

TURBINE EJECTOR PUMP

TYPE WH

FOR AIR LINE SYSTEMS

This apparatus is designed to meet the special requirements of an air exhausting device for heating systems. Durability, simplicity, and ability to operate automatically with unvarying efficiency under all conditions of a heating plant are prime factors to be borne in mind in the design of a pump for this purpose; quietness of operation is also a point of great importance to be considered. With these facts, these essentials of construction constantly before us, we have developed to a high degree of perfection, the silent TURBINE EJECTOR PUMP built around the Ejector principle of producing a vacuum.

DURABILITY

Bronze is used throughout the pump in all principal parts that otherwise would be subject to oxidation to a detrimental degree. The double suction balanced centrifugal impellor is made in two parts and is of bronze. Burs and other roughness of surface are thoroughly cleansed off that efficiency may not be impaired through avoidable friction. The halves of the impellor are then faced and riveted together. Bearings are of phosphor bronze. The pump is essentially water lubricated; however, as an additional precaution, grease cups are provided on the bearings and we recommend their use.

The Turbine Ejector Vacuum Head, the device that creates the vacuum, is also constructed entirely of bronze. The Sylphon Bellows Diaphragm is of metal, and of course is far superior to leather or rubber which will deteriorate rapidly.

Being directly driven the uneven wear of bearings due to the pull of a belt is avoided.

SIMPLICITY

Valves, pinions, gears, springs, belts, and other intricate parts are all excluded from use in this apparatus. The motor is directly connected by flexible couplings to the centrifugal pump which circulates water from the Water Storage Tank at high velocity through the Concentric Turbine Ejector Vacuum Head, extracting a large volume of air. The water is delivered back into the tank carrying with it the air from the heating system which is delivered into the tank and liberated. The process is continuous. Additional water is not necessary. A gray iron copper fitted strainer is provided at the point of connection of the air line to the apparatus, another copper strainer is fitted to the suction end of the centrifugal pump in the bottom of the tank, which is open and supplied with a cover.

AUTOMATIC OPERATION AND UNVARYING EFFICIENCY

The Automatic Starter is of the best obtainable type. This apparatus is mounted upon a Marine Slate Panel or attached directly to and above the Suction Strainer as occasion demands. In both instances the Sylphon Bellows is used. The machine will operate at any desired range of Vacuum between atmosphere and 28″. It is but necessary to throw in the knife switch and the apparatus will automatically do the rest. The range of vacuum is set by us from 4″ to 10″ which is best suited to most requirements.

A point of great importance is that this machine is not effected by condensation, as it will dispose of water or air equally well. As heretofore mentioned, suitable straining facilities are provided, such substance that pass through the strainer cannot in any way effect the life or efficiency of the machine as there are no moving metal parts in close proximity. Quietness is a characteristic of this pump; there is absolutely no noise to be heard but the slight hum of the motor.

It is compact, all parts excepting the tank are mounted upon a single cast iron base. The tank rests flush with the base on the floor. It is but necessary to connect the air line main to the receiving end of the apparatus, and make an overflow and drain connection from the tank to the sump or sewer, together with the wiring connection to motor.

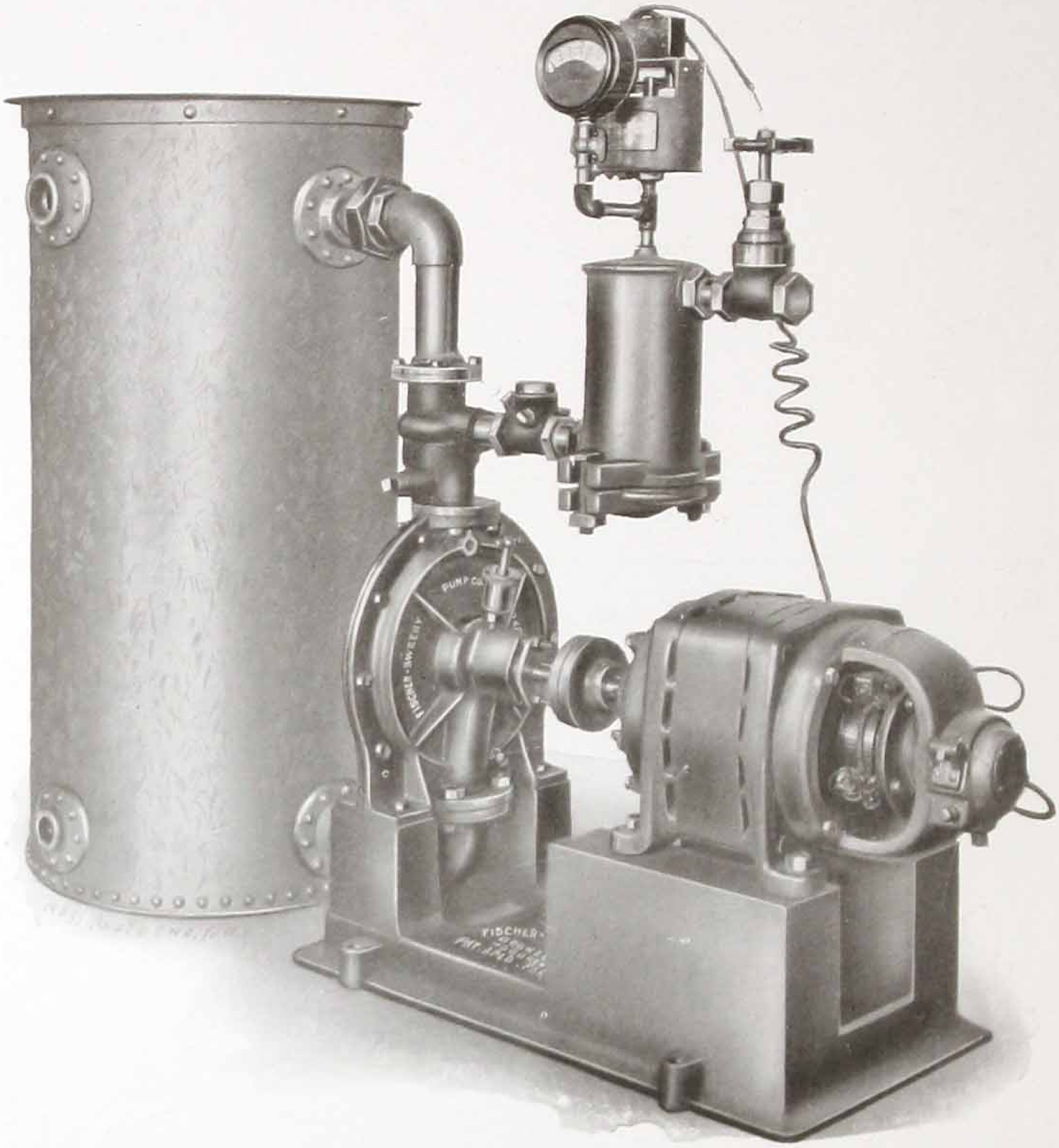
CAPACITIES.

Automatic-Control.

Type and Size	Motor H.P.	Displacement Free Air per Min. Cu. Ft.	Standard Range of Vac.	Capacities in Sq. Ft. of Direct Radiation
1WH	1	6.4	4″ to 10″	5000
2WH	1½	11.8	4″ to 10″	10000
3WH	2	17.	4″ to 10″	18000
4WH	3	27.5	4″ to 10″	38000
5WH	5	38.3	4″ to 10″	65000

MOTORS WOUND D.C. or A.C.

Pumps Assembled-Tested-Adjusted-Regulated and Shipped
Ready to Set in Place and Connect Up to Power Lines.
Larger Sizes Supplied.



TYPE W. H.

TURBINE EJECTOR PUMP

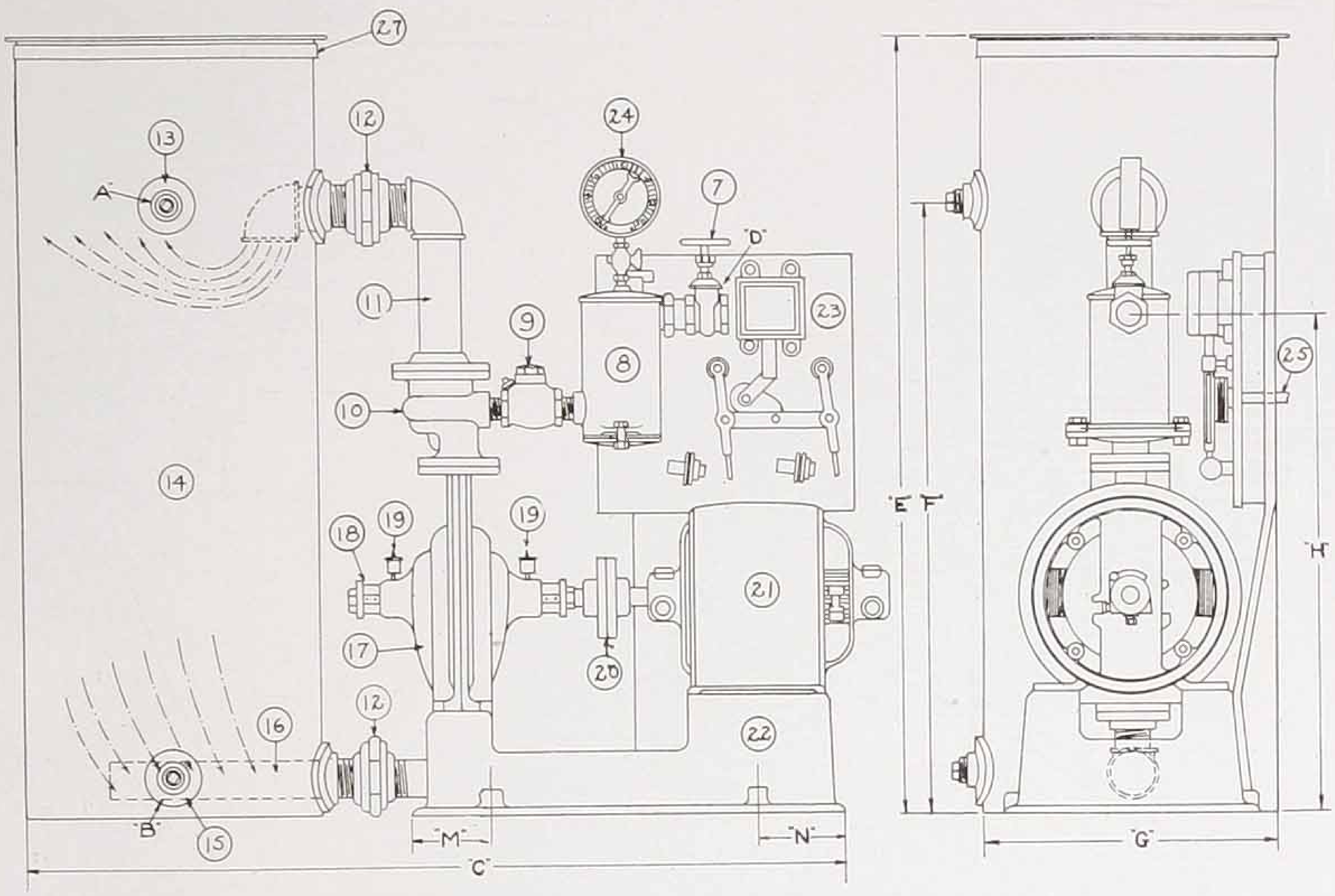
Patented August 25, 1914

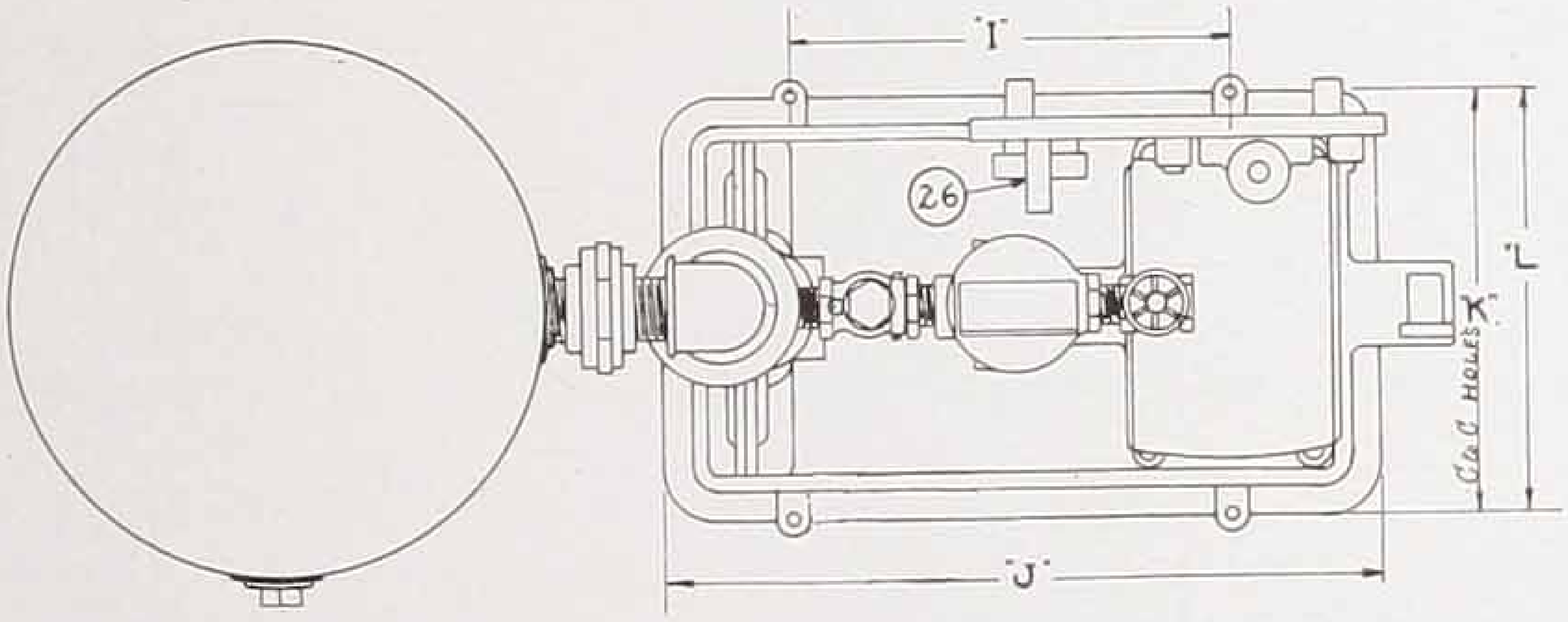
AUTOMATIC OPERATION

EQUIPPED WITH STRAIGHT LINE STARTER

FOR

AIR LINE SYSTEMS





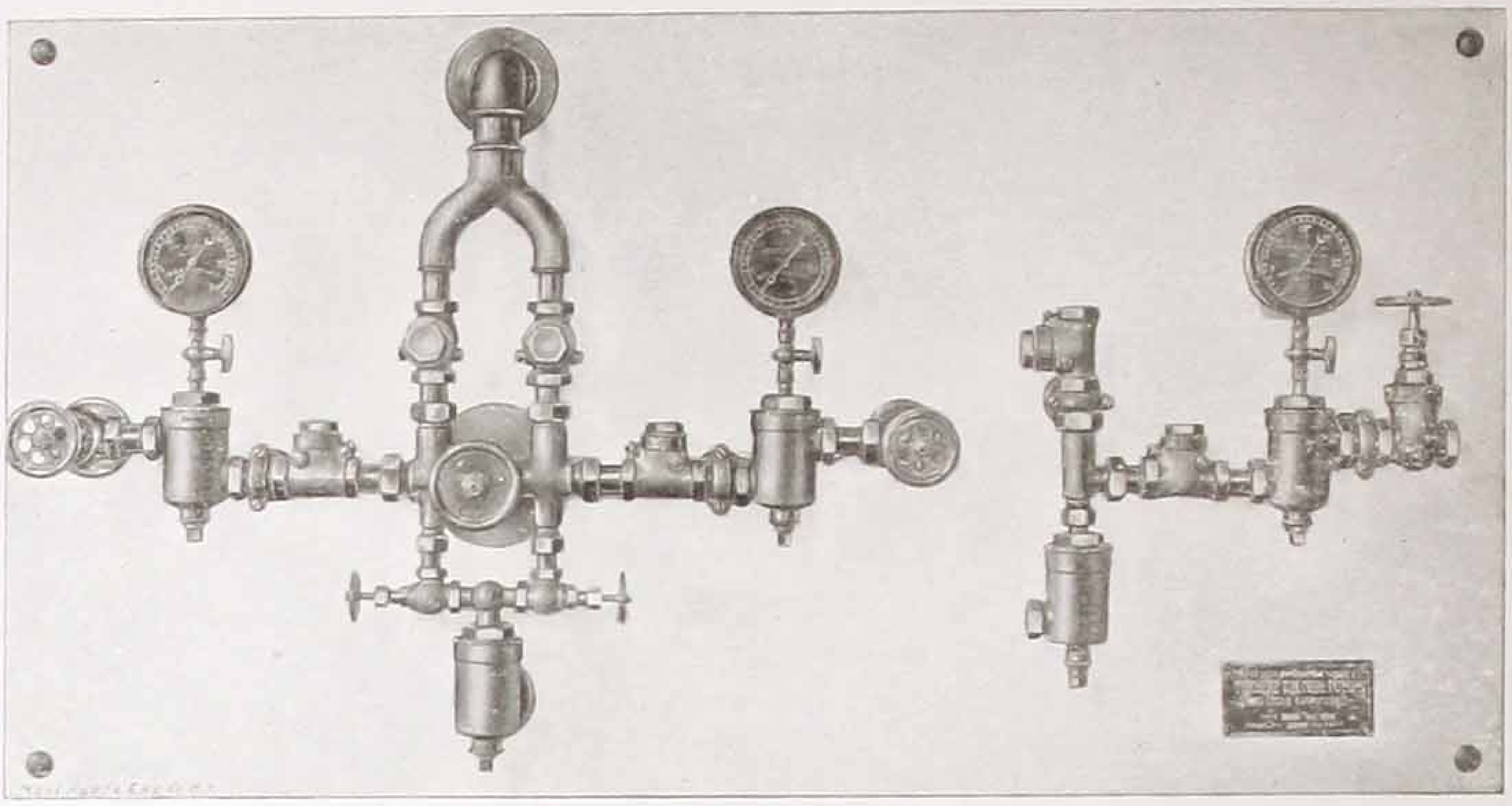
TYPE W-H

TURBINE EJECTOR PUMP

SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1·W·H	1½"	1"	48"	1"	36"	32"	18"	28"	16¾"	26"	13"	13⅜"	4¼"	5"
2·W·H	1½"	1"	48"	1"	36"	32"	18"	28"	16¾"	26"	13"	13⅜"	4¼"	5"
3·W·H	2"	1½"	55"	1¼"	48"	42"	18"	33"	18"	31"	15⅝"	16"	5½"	7½"
4·W·H	2"	1½"	55"	1¼"	48"	42"	18"	33"	18"	31"	15⅝"	16"	5½"	7½"
5·W·H	2"	1½"	55"	1½"	60"	54"	24"	33"	18"	31"	15⅝"	16"	5½"	7½"

7	GATE VALVE AT INLET FROM HEATING SYSTEM.
8	COPPER FITTED SUCTION STRAINER.
9	CHECK VALVE.
10	BRONZE TURBINE EJECTOR HEAD.
11	DISCHARGE FROM PUMP
12	WATER STORAGE TANK COUPLINGS.
13	OVERFLOW CONNECTIONS.
14	WATER STORAGE TANK.
15	DISCHARGE TO DRAIN.
16	COPPER STRAINER.
17	BRONZE FITTED CENTRIFUGAL PUMP.

18	STUFFING BOX AND GLAND! DO NOT TIGHTEN TOO MUCH.
19	GREASE CUPS.
20	FLEXIBLE NOISLESS COUPLINGS.
21	ELECTRIC MOTOR.
22	CAST IRON BASE.
23	AUTOMATIC STARTER AND VACUUM REGULATOR.
24	VACUUM GAUGE.
25	PIPING CONNECTION TO VACUUM GAUGE.
26	VACUUM REGULATING SCREW. ADJUST TO SUIT CONDITIONS.
27	WATER STORAGE TANK COVER.



DOUBLE SINGLE

PAUL STEAM EXHAUSTER

TYPE O. S.

This is the original **Paul Steam Exhauster** for air line systems of heating, has been manufactured by us since it first made its appearance, however, it is well to beware of imitations offered in substitution of this apparatus. You will protect yourself by specifying the **F. S. B. Paul Steam Exhauster** which assures you of the utmost in correct construction, in efficient and effective operation.

The cut shows it as it is now made with all improvements. As this apparatus is generally so well known, and such vast numbers of them in use it is hardly necessary to give a lengthy description of it.

This device is made entirely of bronze with ruby enamel finish and mounted on a stained board panel, or nickle-plated and mounted on a marble panel.

High pressure steam at 40 pounds per square inch and upwards is used to operate it. The steam passing through the jets at high velocity together with its expansion, exhausts a large volume of air from the heating system.

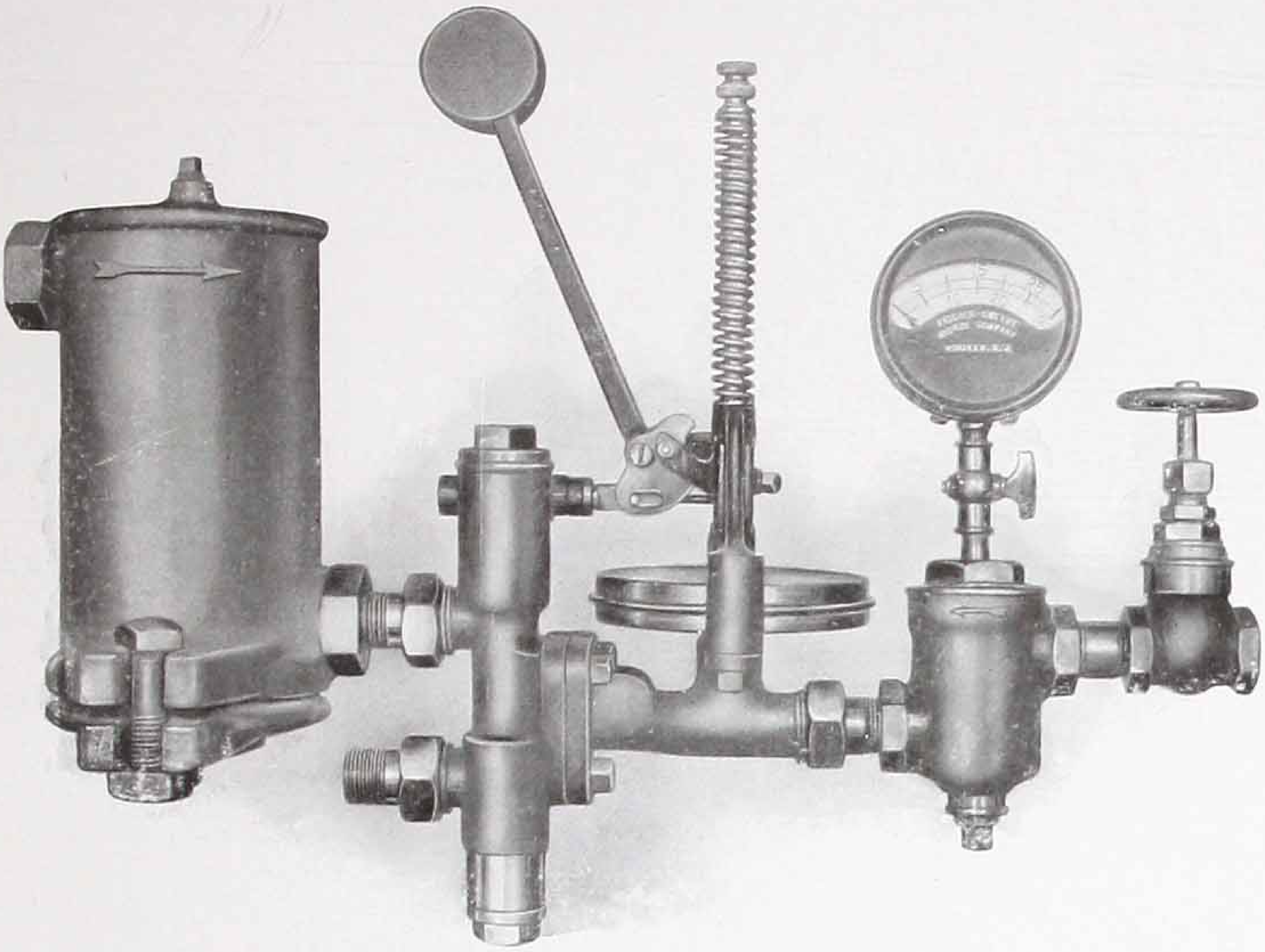
It is practically indestructible and will last indefinitely. Two types are made, the Double and Single Steam Exhausters as above shown.

Provided that the apparatus is properly installed, that is, utilizing the exhaust from it for hot water heating, drying, or other purposes, it is extremely economical to operate.

TABLE

Type	Pressure	Capacity in Sq. Ft. of Direct Radiation
OS	@ 100 lbs.	5,000
OS1	@ 100 lbs.	10,000
OS2	@ 100 lbs.	18,000
OS3	@ 100 lbs.	25,000

Capacities increase with pressure.



PAUL WATER EXHAUSTER

TYPE A. W.

This, the original Paul Water Exhauster is an excellent air exhausting device for residences and moderate sized buildings. Simplicity, durability, and compactness characterize this apparatus. Bronze is used throughout. In addition, it is supplied with a 4x6 Copper Fitted Gray Iron Water Strainer through which the water operating the exhauster is strained.

The Diaphragm of the automatic starting and stopping valve is made of metal.

OPERATION

The water main is attached directly to the feed water strainer. The air line terminates into the suction end of the device at the gate valve. The discharge pipe is attached to the nipple near the bottom at the left of the apparatus and leads directly into the sump or sewer.

The water, which ordinarily should be at 30 pounds pressure or better, passes through the strainer and is admitted to the jets. The flowing of the water at considerable velocity through the jets and into the delivery tube, which in turn discharges into the sump or sewer, creates a vacuum upon the heating system. The gauge mounted above the suction strainer indicates the vacuum being carried. When the vacuum is sufficiently high the metal diaphragm contracts throwing over the pendulum weight which closes the water valve, and the exhauster ceases to operate. The check valve fitted integrally near the jets prevents any infilteration of air back into the system. As the vacuum falls to the starting point, the diaphragm expands, throwing back the pendulum weight, opening the valve, and again starting the exhauster. This operation is continuous.

The water Exhauster will operate between 0″ and 28″ of vacuum. It is usually set by us from 4″ to 10″. This range of vacuum is best suited for most purposes; however, any predetermined range can be set by simply adjusting the thumb screw which increases or decreases the spring tension on the diaphragm.

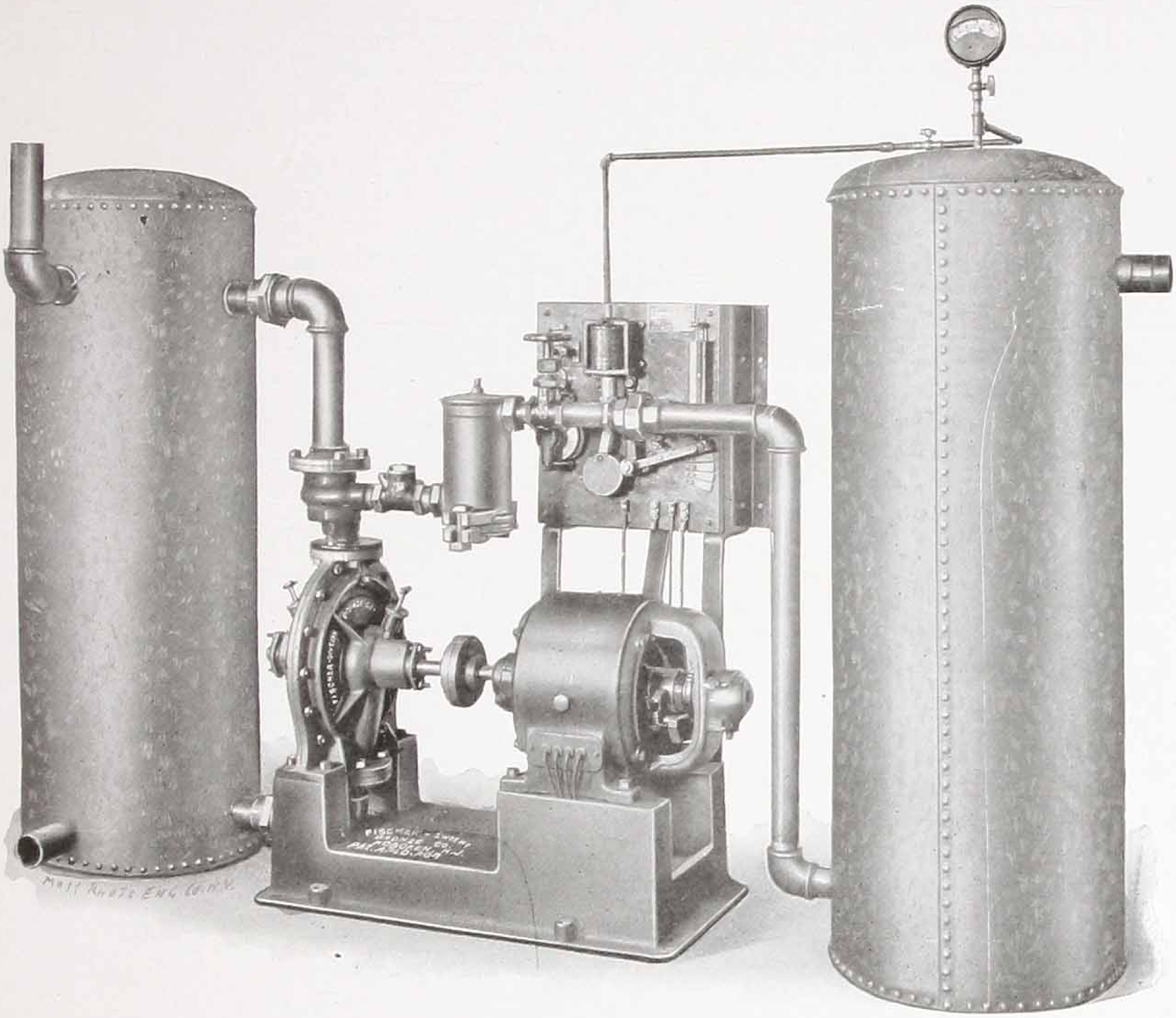
Bear in mind that variable water pressure between 20 and 100 pounds per square inch, in no way adversely effect the operation of the exhauster.

It has been conclusively proven by experience that the original Paul Water Exhauster will economize in water consumption to the greatest possible degree, and consequently is an ideal apparatus for medium sized air line installations. It is but necessary to open the water valve and the exhauster will perform its work indefinitely without any trouble, noise, or attention.

TABLE

Type	Water Pressure	Capacity in Square Feet of Direct Radiation
AW1	30 lbs.	1500
AW2	30 lbs.	2500

Capacities increase with pressures.
Larger sizes supplied.



TYPE W.

TURBINE EJECTOR PUMP

Patented August 25, 1914

AUTOMATIC OPERATION

FOR

RETURN LINE SYSTEMS

ACTING AS

A VACUUM PUMP AND A BOILER FEED PUMP IN LOW PRESSURE PLANTS

TURBINE EJECTOR PUMP

TYPE "W"

FOR RETURN LINE SYSTEMS

It will be readily seen that this apparatus is similar in constructive principle to our Type "WH" TURBINE EJECTOR PUMP for air line systems heretofore described. It consists of the same kind of materials, and to a large degree the construction and operating principle is alike.

An additional tank is used in conjunction with this apparatus when automatic control is desired. Both these tanks are sealed.

OPERATION

The returns of the heating system flow directly into the Vacuum Storage and Receiving Tank from which the returns are drawn by the pump in a manner similar to the suction of air by the Type "WH" air line pump heretofore described and ejected into the Water Storage Tank which primes the pump.

The Water Storage Tank is fitted with an Automatic Air Relief Valve. This permits the expulsion of air from the heating system as the air together with the returns is delivered into the tank. The returns filling the water storage tank close the automatic air relief valve, causing a pressure to be created within the tank due to the continued action of the pump. When the pressure in the tank slightly exceeds the boiler pressure the returns are discharged directly into the boiler through the connection at the bottom of the tank, which should be fitted with a check valve. There is always sufficient water retained within the tank to keep the pump primed. This is assured by the automatic air relief valve opening and relieving the pressure when the returns have fallen to a certain level. This operation is continuous and is governed by the automatic control.

The action of the Automatic Regulator stopping and starting the machine is not governed by the quantity of the returns, but by the actual vacuum conditions of the system.

This apparatus is designed for low pressure heating systems not exceeding 10 lbs. It will be readily seen that this is an extremely compact unit comprising both the functions of a vacuum pump and a boiler feed pump.

Stand pipes, elevated tanks, float switches, and any other such devices are all unnecessary in connection with this arrangement.

For high pressure plants or where a continuous operating machine is desired we provide but one sealed tank with stand pipe and draining connections.

In high pressure plants the returns from the heating system are forced by the action of the pump into the Water Storage Tank and discharged from this tank through a connection into a hydro-pneumatic tank which separates and releases the air. A connection is made from the hydro-pneumatic tank to a boiler feed pump which forces the returns back into the boiler.

In low pressure plants not exceeding 10 pounds the returns are forced up a stand pipe to a height sufficient to overcome the boiler pressure. From this point an atmospheric connection is made liberating the air; the head of the water in the descending pipe to the boiler is then sufficient to feed the returns back into the boiler.

Certain conditions and special requirements may make it more desirable to use this type of apparatus in a low pressure heating system, but as a general rule we recommend the use of our automatic arrangement as heretofore described for low pressure return line systems of heating.

CAPACITIES.

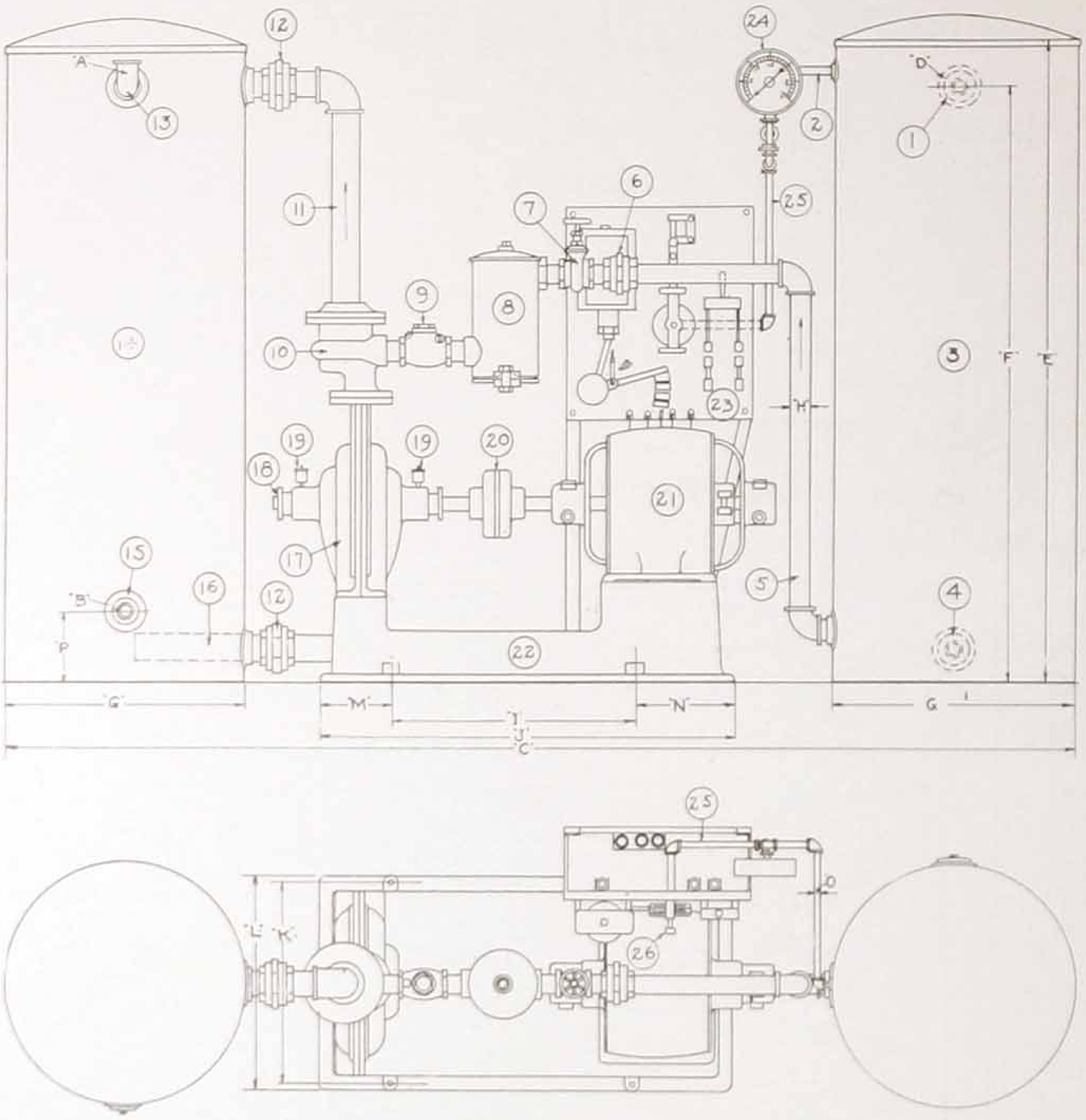
Automatic-Control or Continuous Operating.

Type and Size	Motor H. P.	Condensation Discharge Gals. per Min.	Condensation Discharge Against Boiler Pressure	Capacities in Sq Ft. of Radiation
2W	2	13	0 to 10 lbs.	10000
3W	3	28	0 to 10 lbs.	25000
4W	5	41	0 to 10 lbs.	40000

Motors Wound D.C. or A.C.

Pumps Assembled-Tested-Adjusted-Regulated and Shipped Ready to Set in Place and Connect Up to Power Lines.

Larger Sizes Supplied.



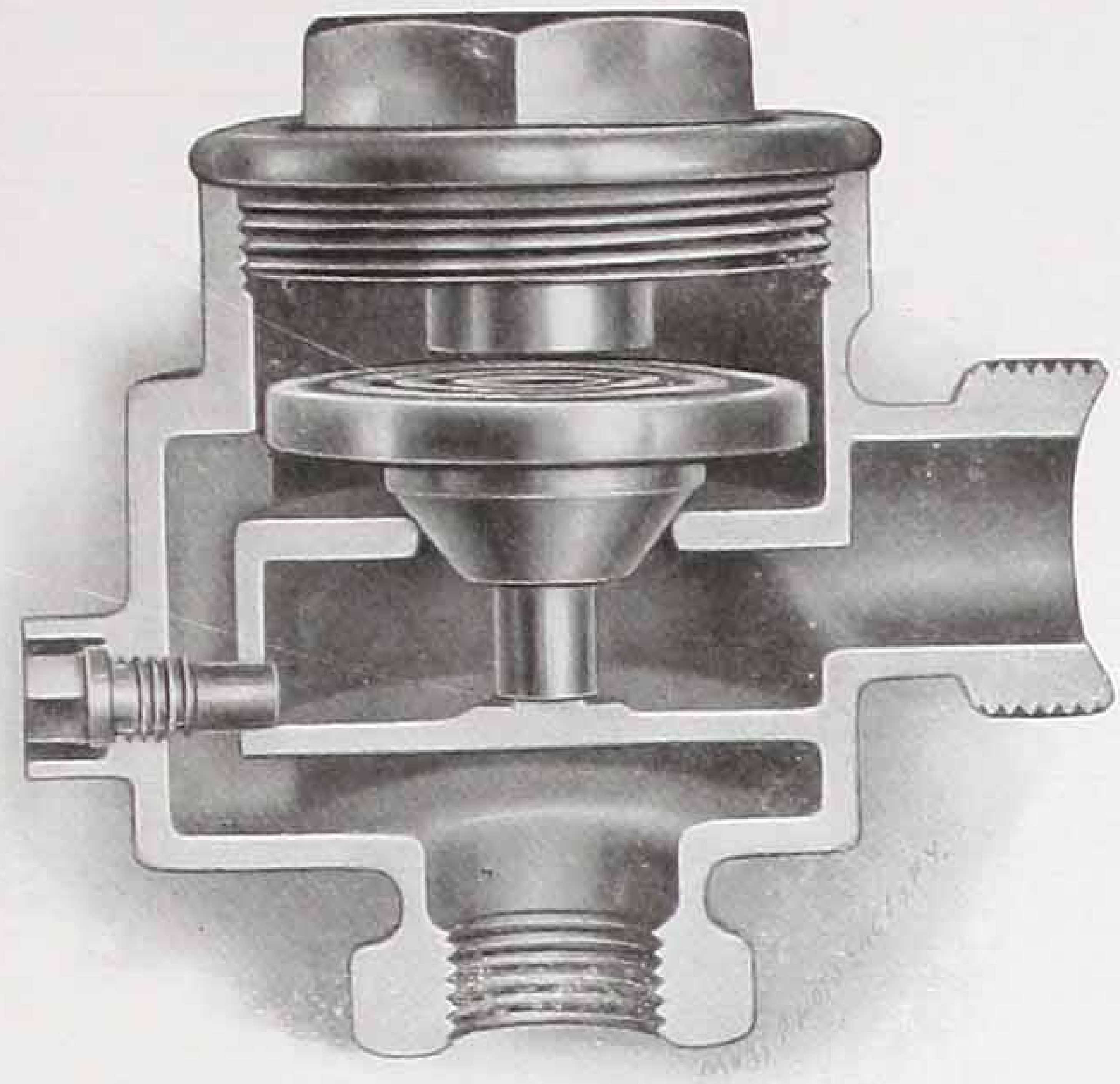
TYPE 'W'

TURBINE EJECTOR PUMP.

SIZE	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'	'M'	'N'	'O'	'P'
2-W	1¼"	2"	76"	2"	48	45"	18"	1¼"	18"	31"	15⅝	16"	5½	7½"	¼"	3⅜"
3-W	1½"	3"	76"	2"	48	45"	18"	1½"	18	31"	15⅝	16"	5½	7½	¼"	3⅜"
4-W	2"	4"	88⅛	3"	60"	56"	24"	2"	18"	31"	15⅝	16"	5½	7½"	¼"	3⅜"

1	INLET FROM HEATING SYSTEM.
2	VACUUM REGULATING CONNECTION.
3	VACUUM STORAGE AND RECEIVING TANK
4	DRAIN OUTLET
5	SUCTION PIPE
6	SUCTION PIPE COUPLING.
7	SUCTION PIPE GATE VALVE
8	COPPER FITTED SUCTION STRAINER
9	CHECK VALVE.
10	BRONZE TURBINE EJECTOR HEAD
11	DISCHARGE FROM PUMP
12	WATER STORAGE TANK COUPLINGS
13	AUTOMATIC AIR RELEIF VALVE

14	WATER STORAGE TANK.
15	DISCHARGE TO BOILER AND DRAIN.
16	COPPER STRAINER
17	BRONZE FITTED CENTRIFUGAL PUMP.
18	STUFFING BOX AND GLAND; DO NOT TIGHTEN TOO MUCH
19	GREASE CUPS.
20	FLEXIBLE NOISELESS COUPLINGS
21	ELECTRIC MOTOR.
22	CAST IRON BASE
23	AUTOMATIC STARTER AND VACUUM REGULATOR.
24	VACUUM GAUGE
25	PIPING CONNECTIONS FROM VACUUM REGULATOR TO TANK THREE AND VACUUM GAUGE.
26	VACUUM REGULATING SCREW. ADJUST TO SUIT CONDITIONS.



TYPE B-14

THE B. V. M.

BRONZE THERMOSTATIC STEAM-TRAP AND CHECK VALVE

(Pats. Applied for)

A marked advance in the scope of action of a thermostatic valve is represented in the B. V. M., for not only does it act as a steam trap, but in addition it acts as a check valve. Because of this, a combination of thermostatic and check valve action it is unique in the position of being the only vacuum valve for return line systems of heating combining these features.

With the ordinary type of trap it is necessary to use a vacuum pump or other exhausting device in order to have a vacuum system of heating; however, not so with the B. V. M., which, when used without a pump, especially in medium sized installations makes a first class vapor system. The B. V. M. valve is normally closed, a slight pressure of less than 3 ozs. opens it. It is so constructed that it prevents any infilteration of air back into the system after having been expelled, consequently the natural reduction of pressure caused by the condensing steam is totally confined within the radiators and supply piping of the system.

This partial vacuum produced by taking full advantage of natural conditions is the cause of a circulation of steam or vapor at or below atmospheric pressure which, of course, means the benefit from heat that is ordinarily lost. In this respect the B. V. M. Valve is also of especial value, when the fires are banked and the pump stopped.

In the B. V. M. Valve bronze is used throughout. A point of importance is that all parts are separate and interchangeable so that in case of accident any part can be replaced quickly and conveniently with but a very slight cost.

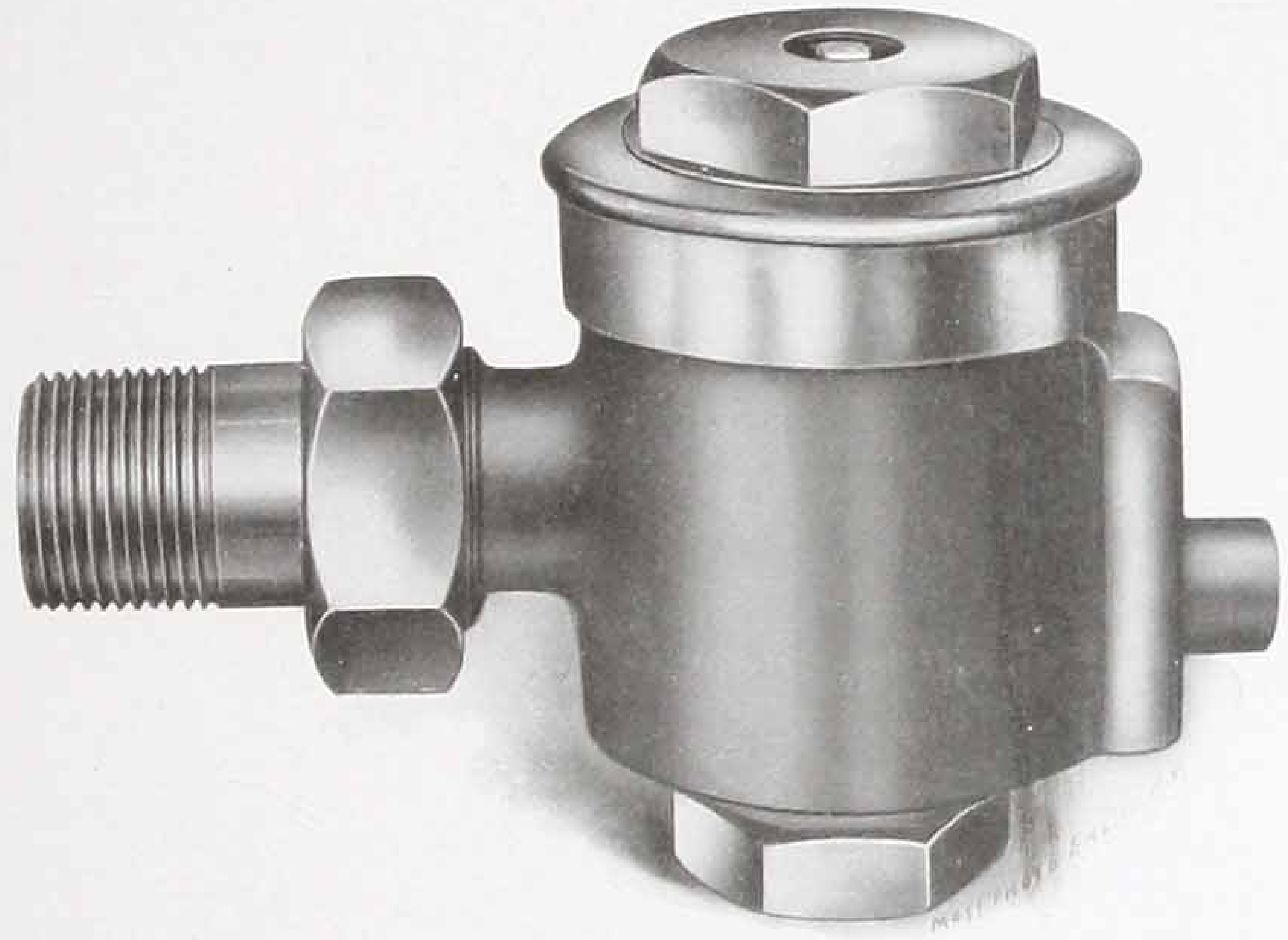
Of great importance is the Diaphragm the heart of a valve. Intrinsically a Valve is no better than its Diaphragm. Our Diaphragm is made of Phosphor Bronze sufficiently thick to make it tough and durable, and yet thin enough to be extremely sensitive and responsive. The two Discs of the Diaphragm, bottom and top are put together. The outer disc is spun over the inner disc, the Diaphragm is hard soldered. This process minimizes the possibility of leakage, in fact to such an extent that we will replace free of charge any diaphragm that leaks within five years. A standard formula of volatile liquids especially adapted to this purpose is used.

Below the valve orifice there is a dirt chamber. Foreign substances of all kinds continually found in a heating system are to a large extent trapped in this chamber, especially the larger and heavier particles. This feature effectively prevents the mutilation of the valve disc or seat. Metallic dirt, scale, core sand, or other substances will in time mutilate the valve disc and seat. This is caused by the dirt getting caught between these two members when the valve is about to close due to the expansion of the diaphragm. Under this condition one of two things will happen. Either the valve will stay open passing steam, or the substance will imbed itself in the valve disc or seat.

A valve continually subject to this mutilation can hardly be a close fitting tight valve after having been in service for some time. The fact that a valve of this type is still operating after having been in use for a long period is by no means a reliable indication that it does not leak, in all probabilities it does, though not to such an extent as to be readily perceptible.

A lock shield by-pass makes it very convenient for the person in charge to instantly open the by-pass with a key. The steam pressure will blow out the accumulation of dirt.

The lock shield by-pass offers an easy and quick method of "blowing out" a new heating system. It is but necessary to insert the key and open the port through which the dirt will be blown down through the system. The steam will close the valve isolating the diaphragm from its path and preventing any possibility of its rupture.



TYPE C-14

Our Type C-14 is fitted with a lock shield adjustment through the top of the bonnet, any desired adjustment meeting any conditions can instantly be made simply by inserting the lock shield by-pass key and turning accordingly, consequently it is not necessary to use a wrench to clean or adjust.

All valves are tested and set to pass water of condensation and air from 3 ozs. pressure up to and including 10 lbs. pressure, and furthermore to retain steam within this range.

The action of the diaphragm situated in the discharge chamber shutting the valve against steam is a safety feature of great importance. It prevents the constant strain exerted upon a diaphragm, situated in the steam element, which when closed is subject to the full strain produced by an increase in the temperature of the steam making it constantly subject to rupture.

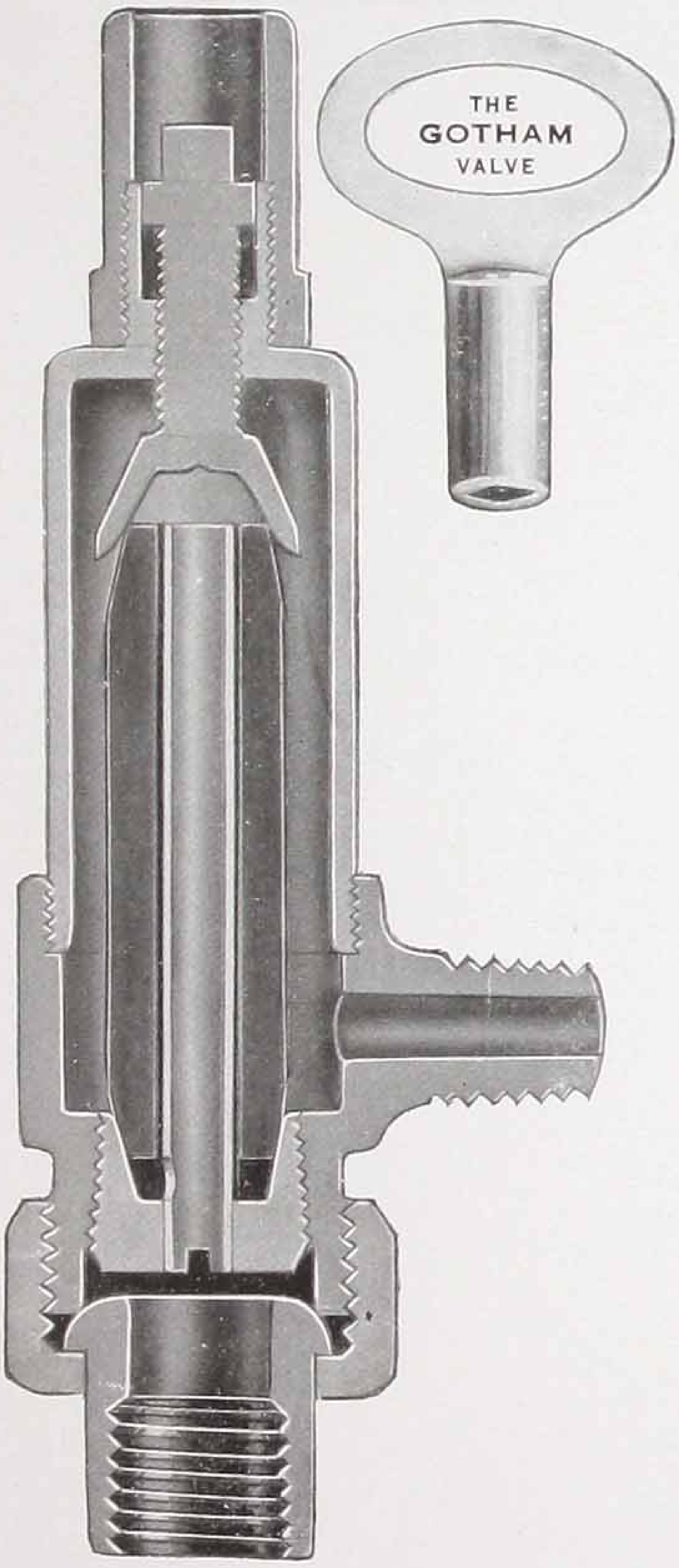
Unlike many, the diaphragm of the B. V. M. Valve is situated in such close proximity to the valve orifice that it is virtually in the path of escaping steam causing it to be extremely sensitive and responsive to the respective conditions. Because of this it is guaranteed to act as well with a vacuum in the return side of the system as one closing with steam.

We are confident that the performance of this valve if set up and tested with others. will be such that it will well warrant a place in your specifications.

"GOTHAM" LOCK SHIELD

VACUUM AIR VALVE

"A post valve that is guaranteed not to buckle for five years."



PATENTED

This air valve used in connection with our Paul Air Line System of Vacuum Heating is one made for us by a long established and reputable manufacturer of air valves.

These valves have been in use in buildings for over fifteen years and are still giving satisfactory service. This is an enviable achievement unattained by other manufacturers.

Insert the key and any adjustment desired can be made by simply turning; yet it is practically impossible for anyone but the holder of the key to alter the adjustment of the valve.

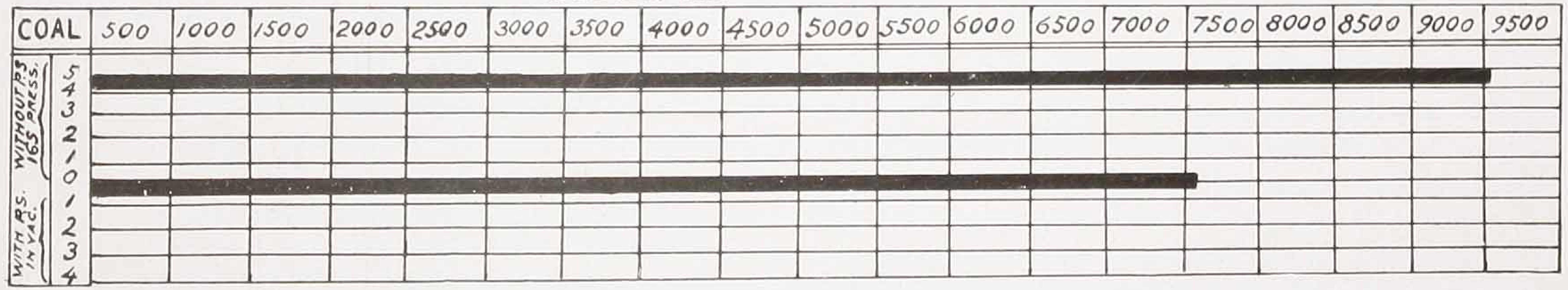
Air valves of all kinds and descriptions are on the market, but few of them are of genuine merit. Some include very good features but unfortunately are at fault in others. If you want an air valve that is not an experiment, that is of proven and conceded efficiency, then specify the F. S. B. "GOTHAM" Lock Shield Air Valve.

Most of the heating and ventilating engineers are well acquainted with this valve's construction. In appearance it is ornamental, in operation it is lastingly efficient. We stand back of it, and guarantee it to be free from all mechanical defects, and also the thermostatic post to retain its elasticity and not buckle. If otherwise we will promptly replace or refund.

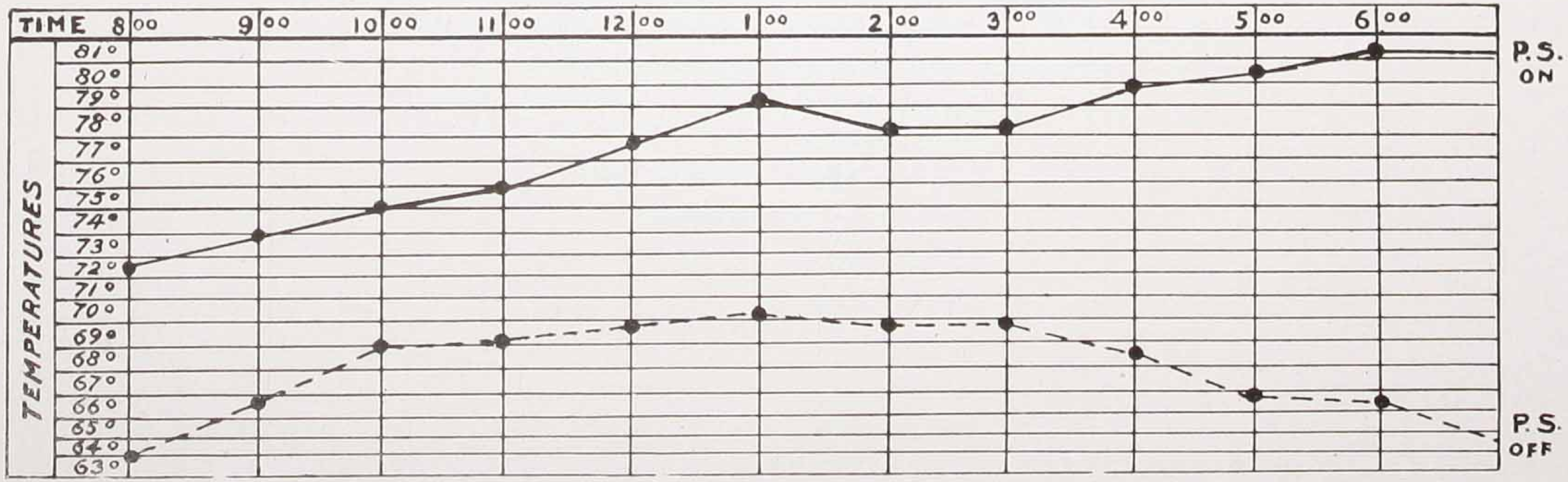
The use of the "GOTHAM" Valve with any type of our air exhausting devices will give a perfectly operating, and satisfactory air line vacuum system of heating. If our simple installation instructions are carefully observed we will unconditionally guarantee total satisfaction.

TEST SHOWING COAL CONSUMED AT THE MONADNOCK BLDG. AND TEMPS. ATTAINED WITH AND WITHOUT THE PAUL SYSTEM

CHICAGO, ILL.



AVERAGE TEMPERATURES ATTAINED IN THE ENTIRE BUILDING WITHOUT AND WITH PAUL SYSTEM ATTACHED



The coal consumption test shows a comparison between a pressure ranging from 4 to 5 lbs. and steam circulated at about atmospheric pressure. The temperature test indicates the variation in temperatures with the Paul System in operation and without the Paul System.

In the

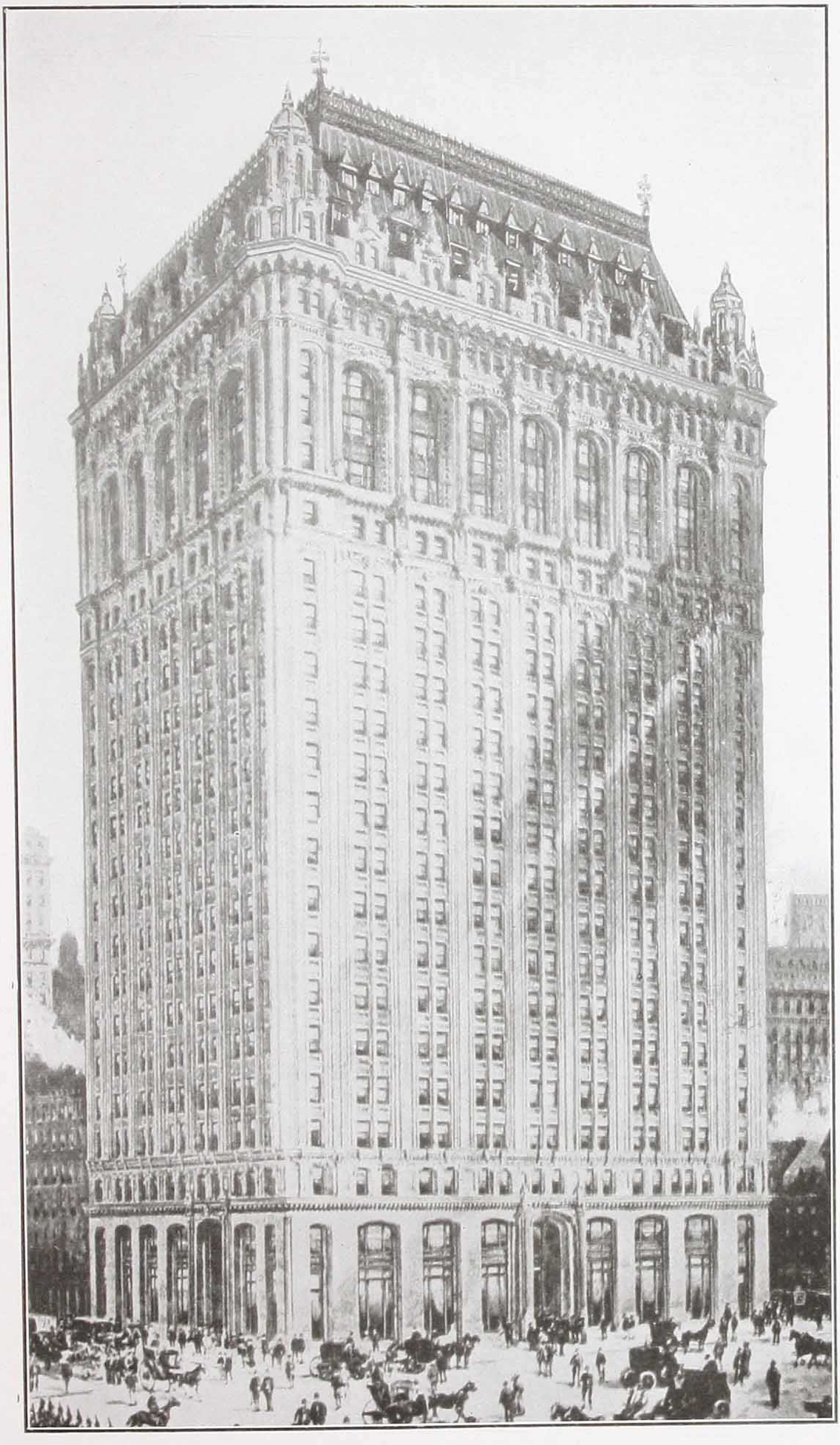
following pages we present

a few photographs

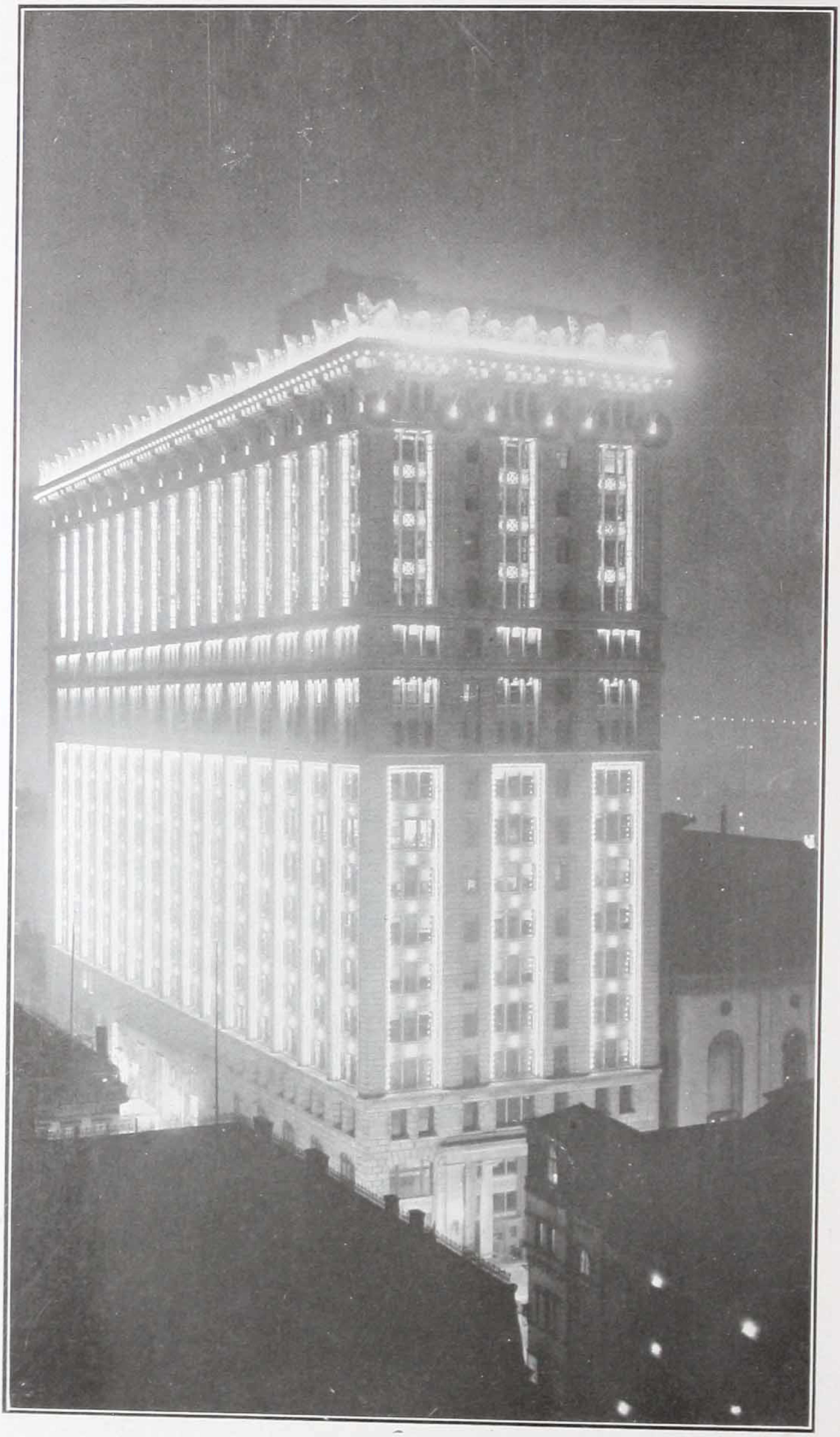
of buildings containing various types

of Vacuum Heating Apparatus

manufactured by us.



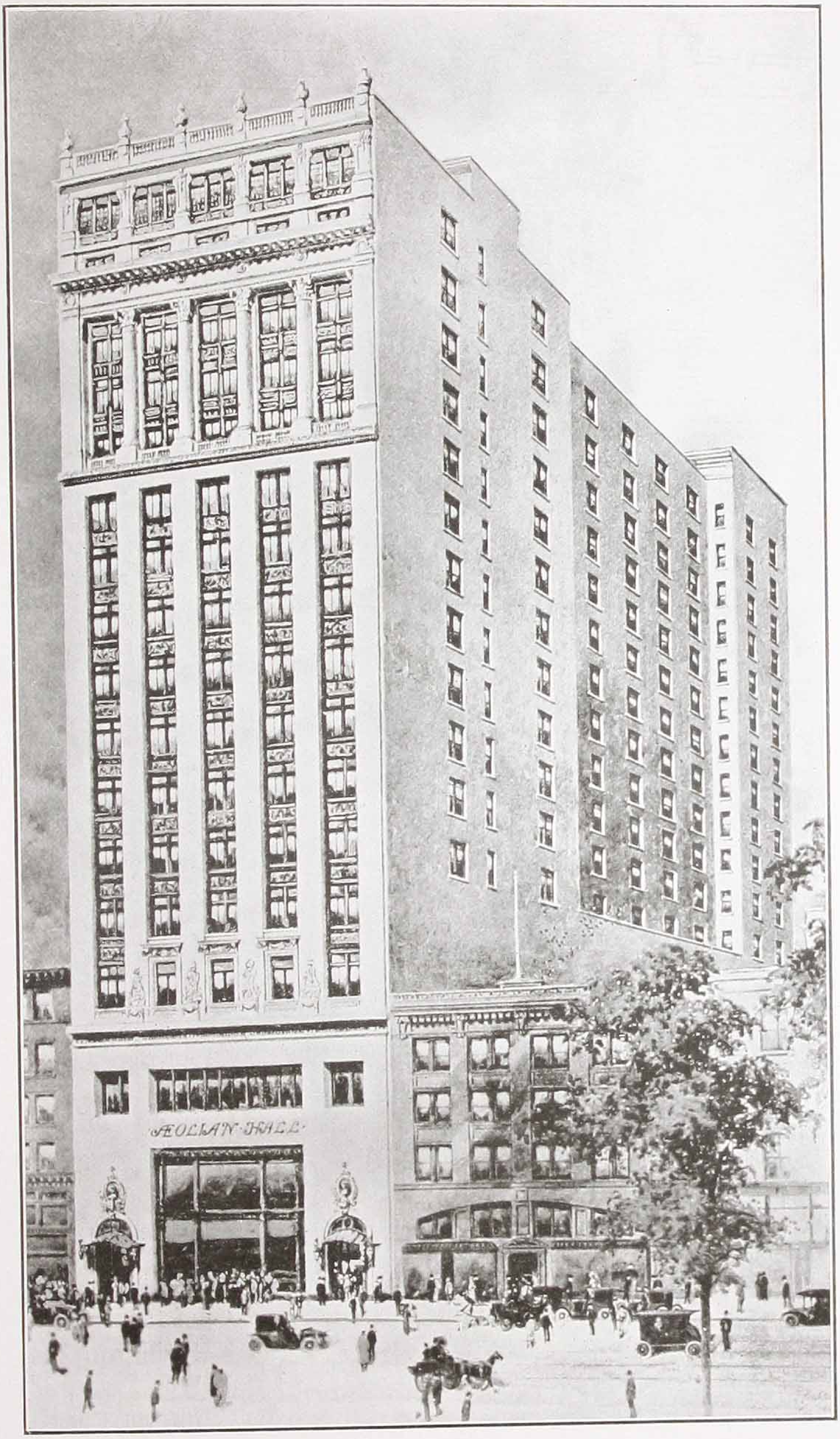
90 West St. Building, New York City.



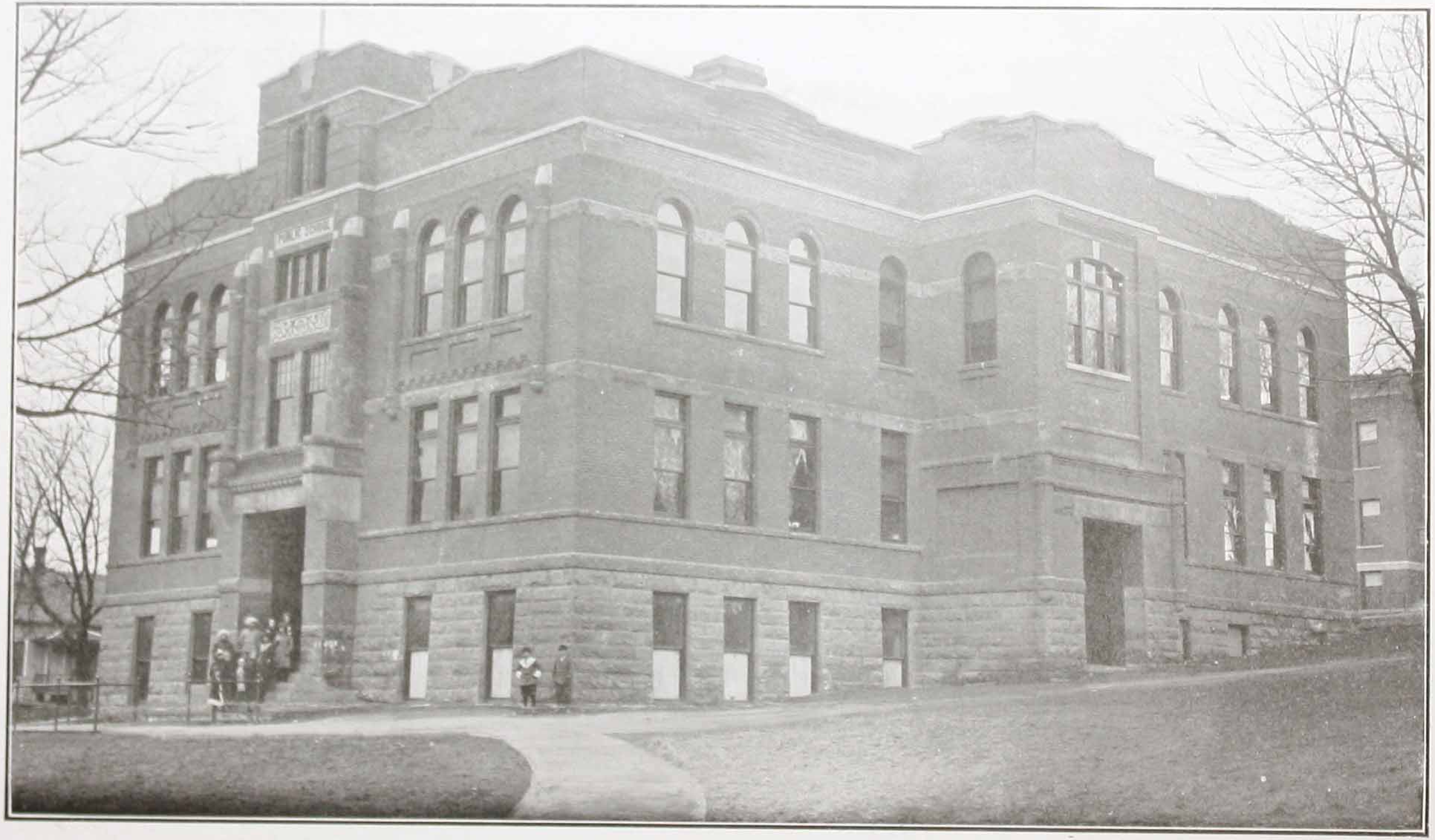
Consolidated Gas Co's. Bldg.—New York City.

W. Cullen Morris, Engineer and Architect.
New York City.

H. P. Stephenson Co., Heating Contractors.
New York City.



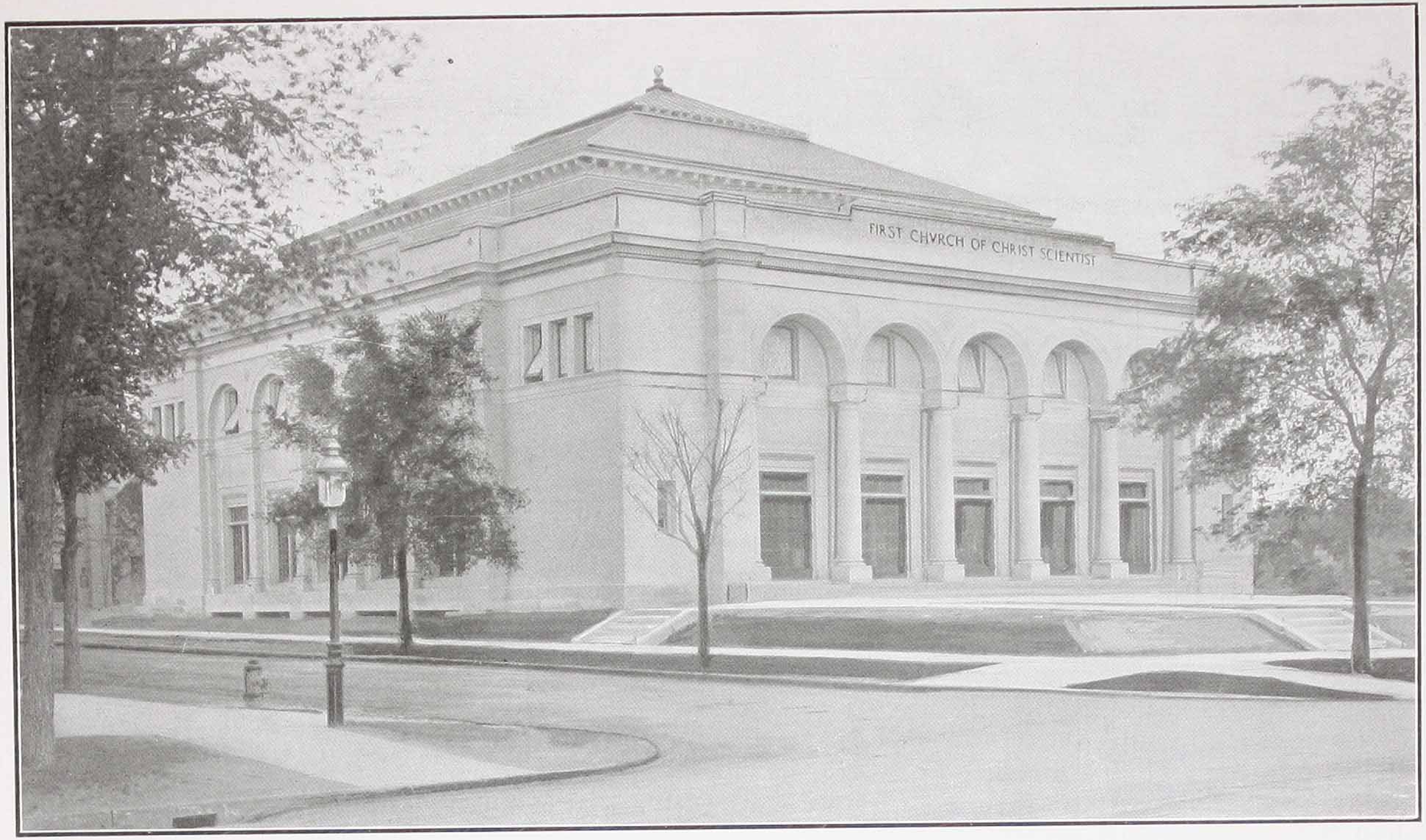
Aeolian Hall, New York City.



Public School. Jackson, Minn.

Kirby T. Snyder, Architect.
Minneapolis, Minn.

M. J. McGrath, Heating Contractor.
Minneapolis, Minn.

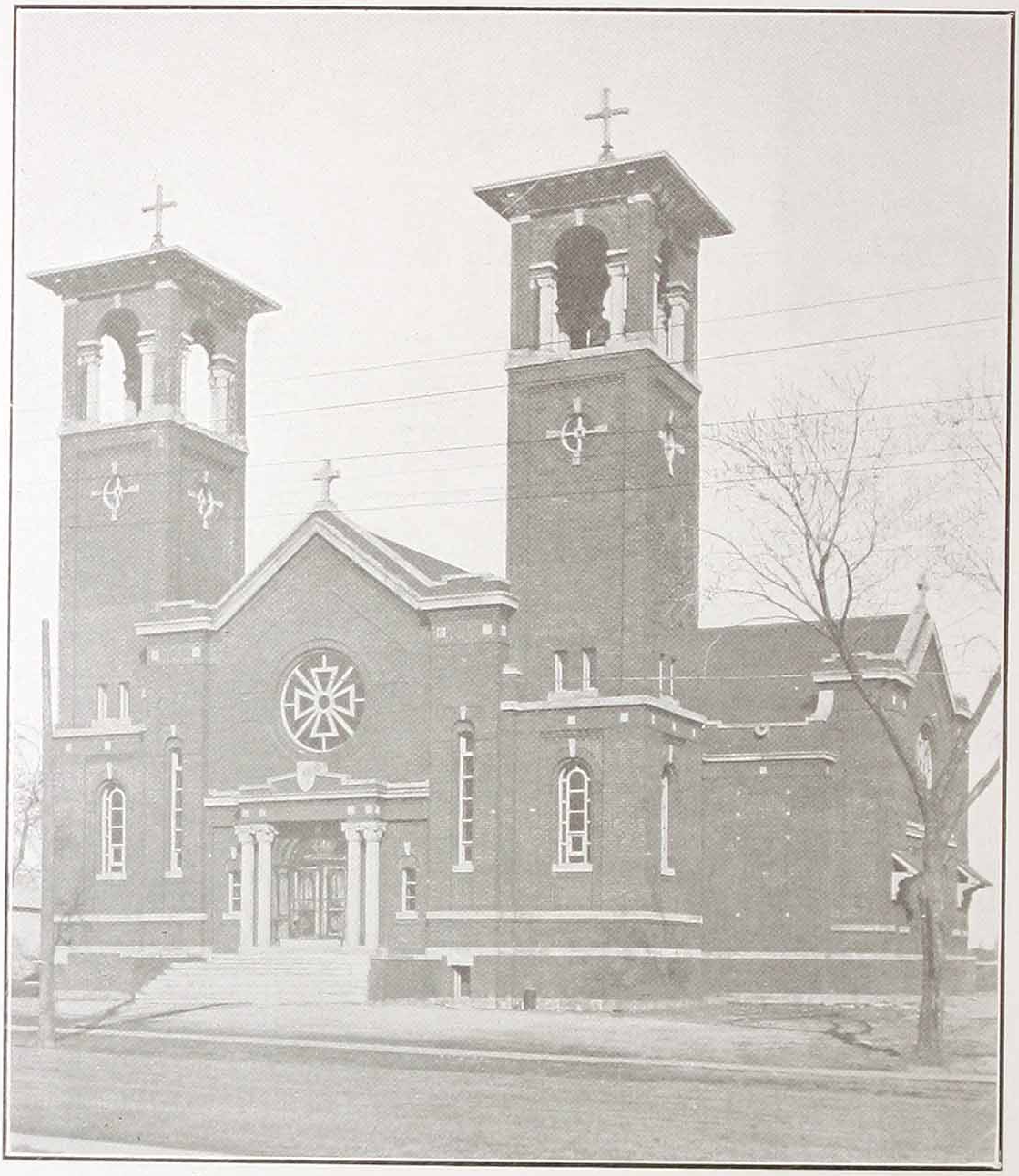


First Church of Christ Scientist. St. Paul, Minn.

Clarence H. Johnston, Architect.
St. Paul, Minn.

Chas. L. Pillsbury Co., Consulting Engrs.
St. Paul, Minn.

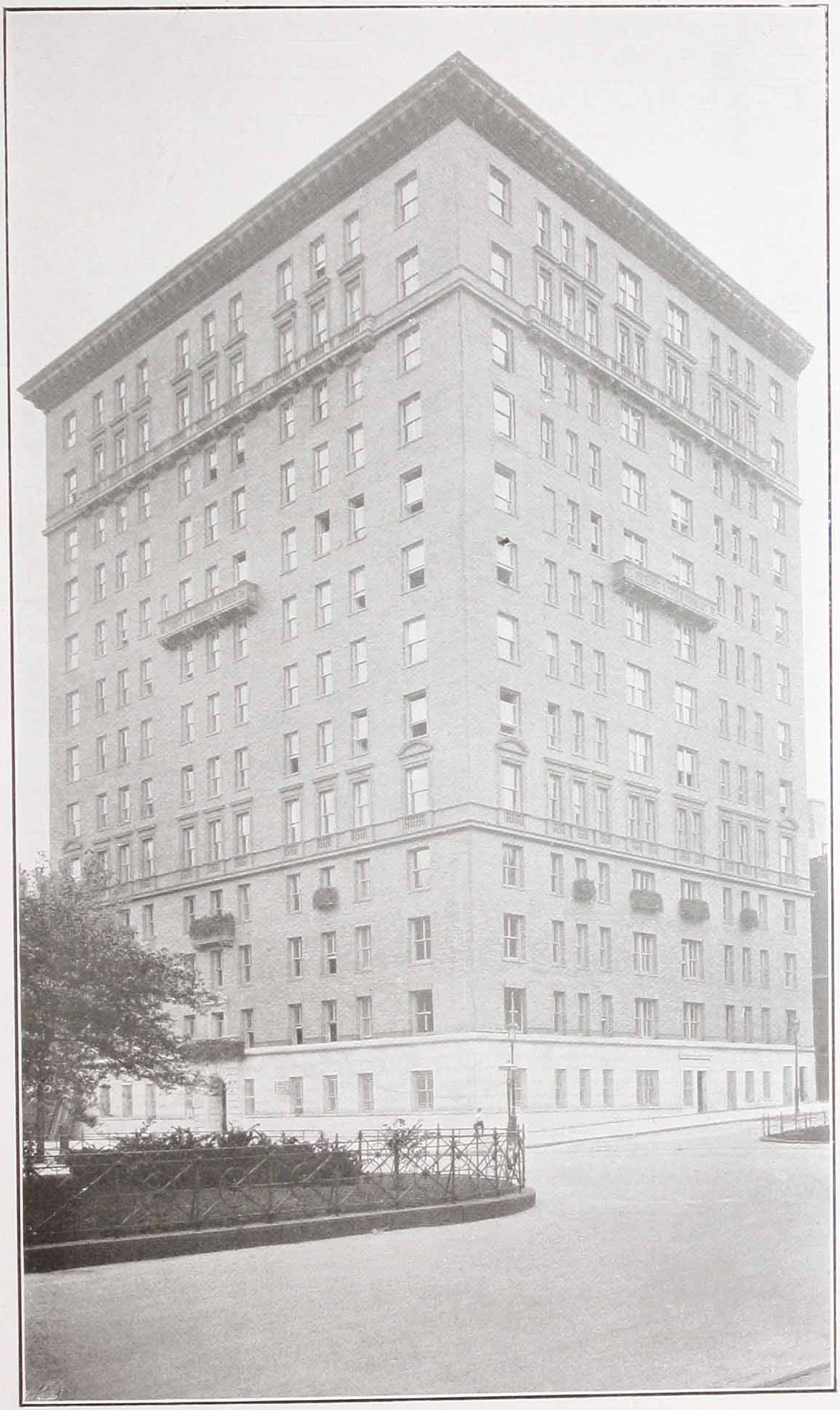
Hanke & Eha, Heating Contractors.
St. Paul. Minn.



St. Dominic Church. Monthfield, Minn.

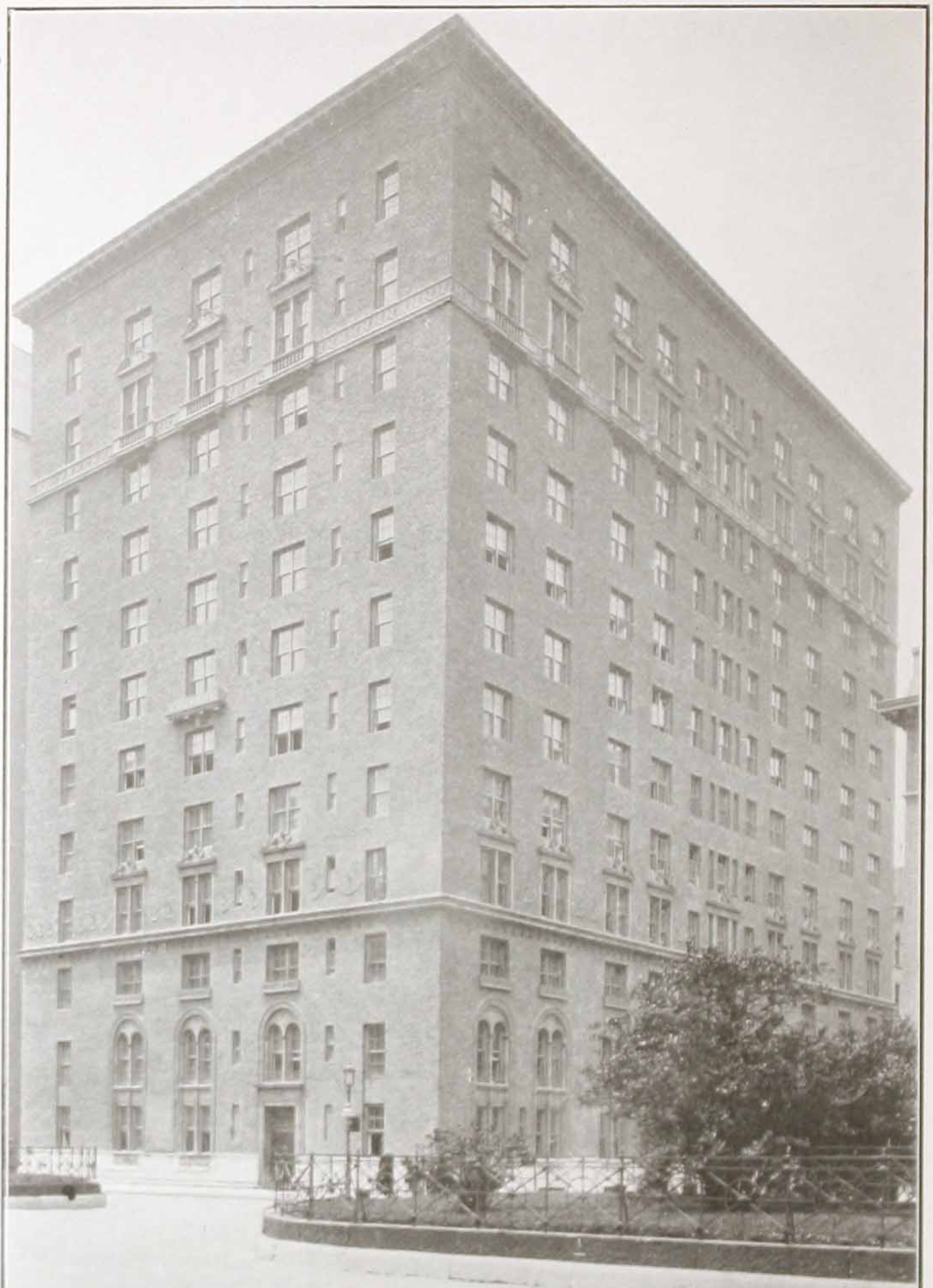
John Wheeler, Architect.
St. Paul, Minn.

P. J. Gallagher, Heating Contractor.
Faribault, Minn.



Levy Apartments, New York City.

Rouse & Goldstone, Architects. **Chauncy Matlock,** Heating and Ventilating Engr.
New York City. Osborne Rea. Co., Heating Contractors, **New York City. New York City.**

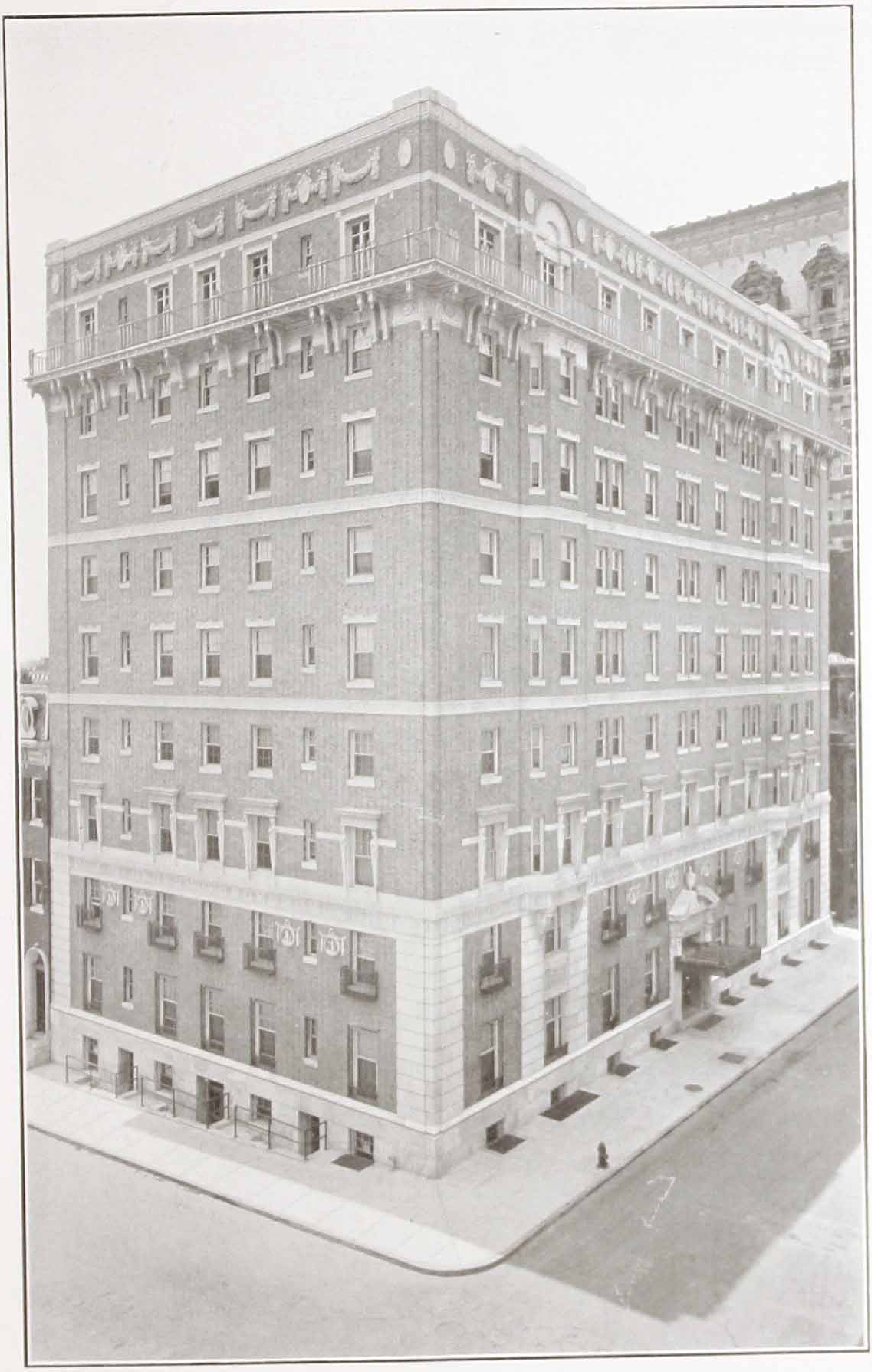


Johnson Apartments, New York City.

Rouse & Goldstone, Architects.
New York City.

Chauncy Matlock, Heating and Ventilating Engr.
New York City.

Osborne Rea. Co., Heating Contractors.
New York City.



Algonquin Apartments, Baltimore, Md.

Wyatt & Nolting, Architects.

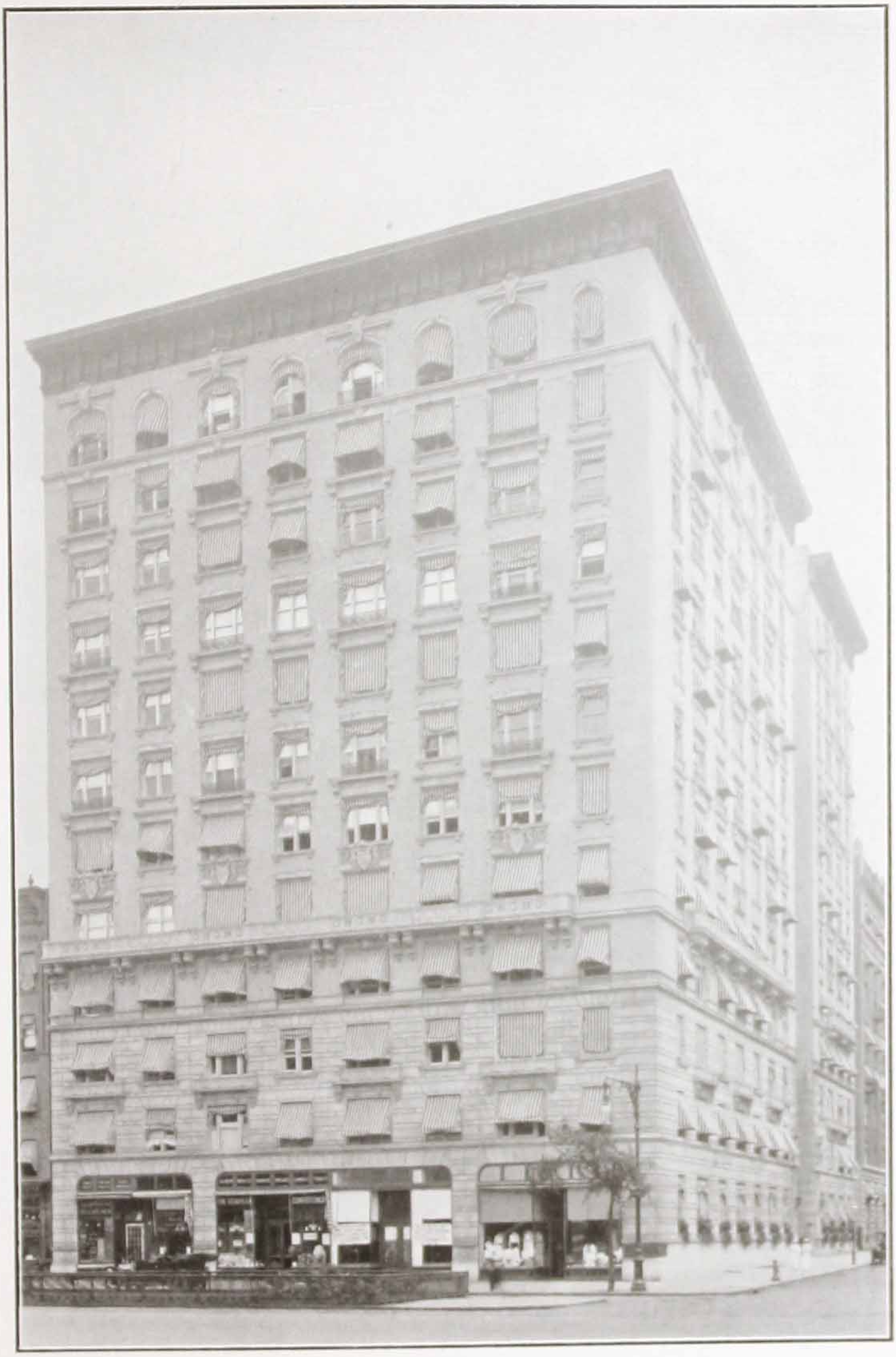
W. E. Hill & Co., Heating Contractors.
Baltimore, Md.

Beaumond Apartments, New York City.

Geo. & Edw. Blum, Architects. **Raisler Heating Co.,** Heating Contractors.

New York City. **P. R. Moses,** Engineer. New York City.

New York City.

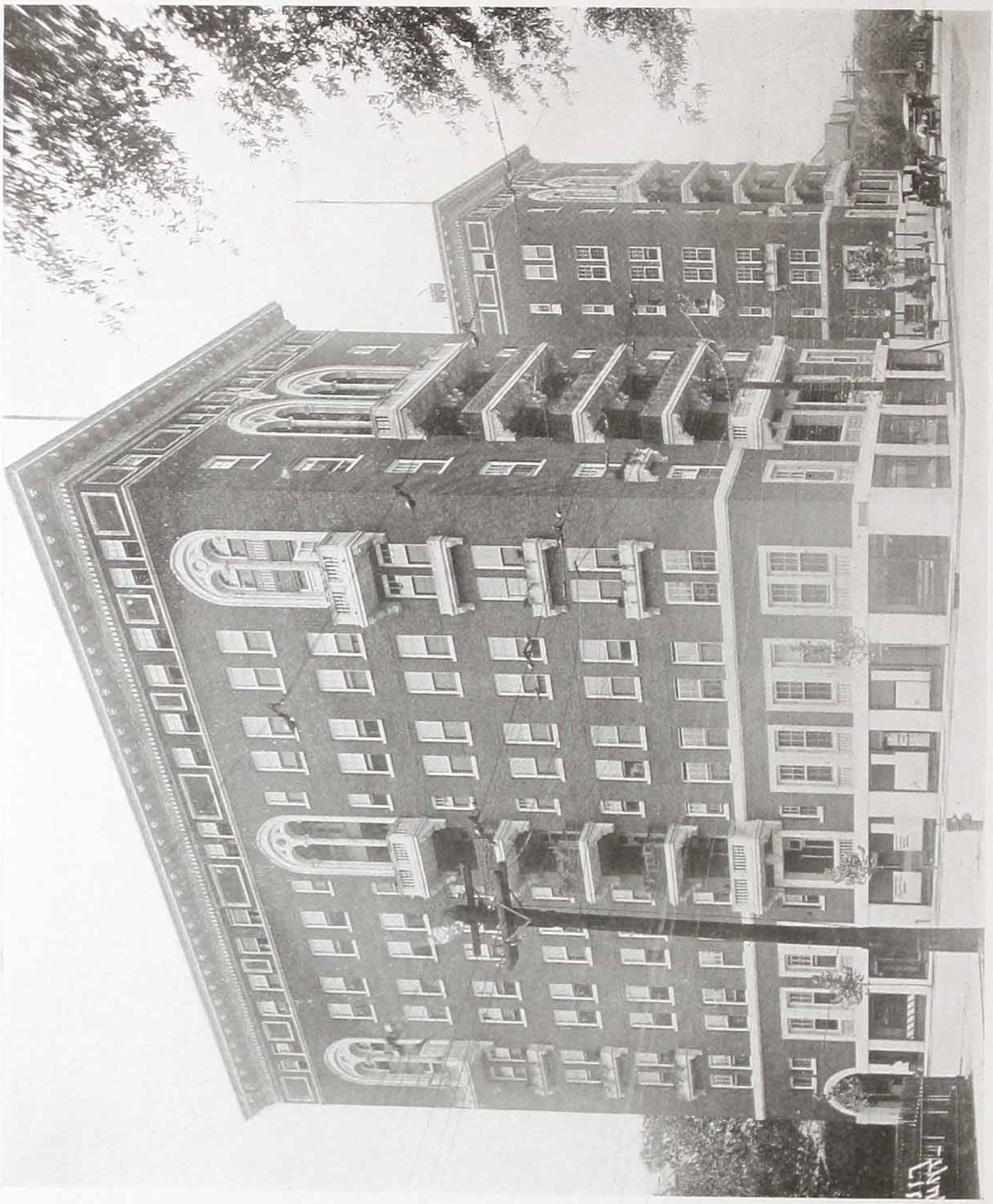


Brogan Apartments, New York City.

M. Gaeton Ajello, Architect.
New York City.

Clark MacMullen & Riley, Heating and Ventil. Engs.
New York City.

M. J. Callahan, Heating Contractor.
New York City.

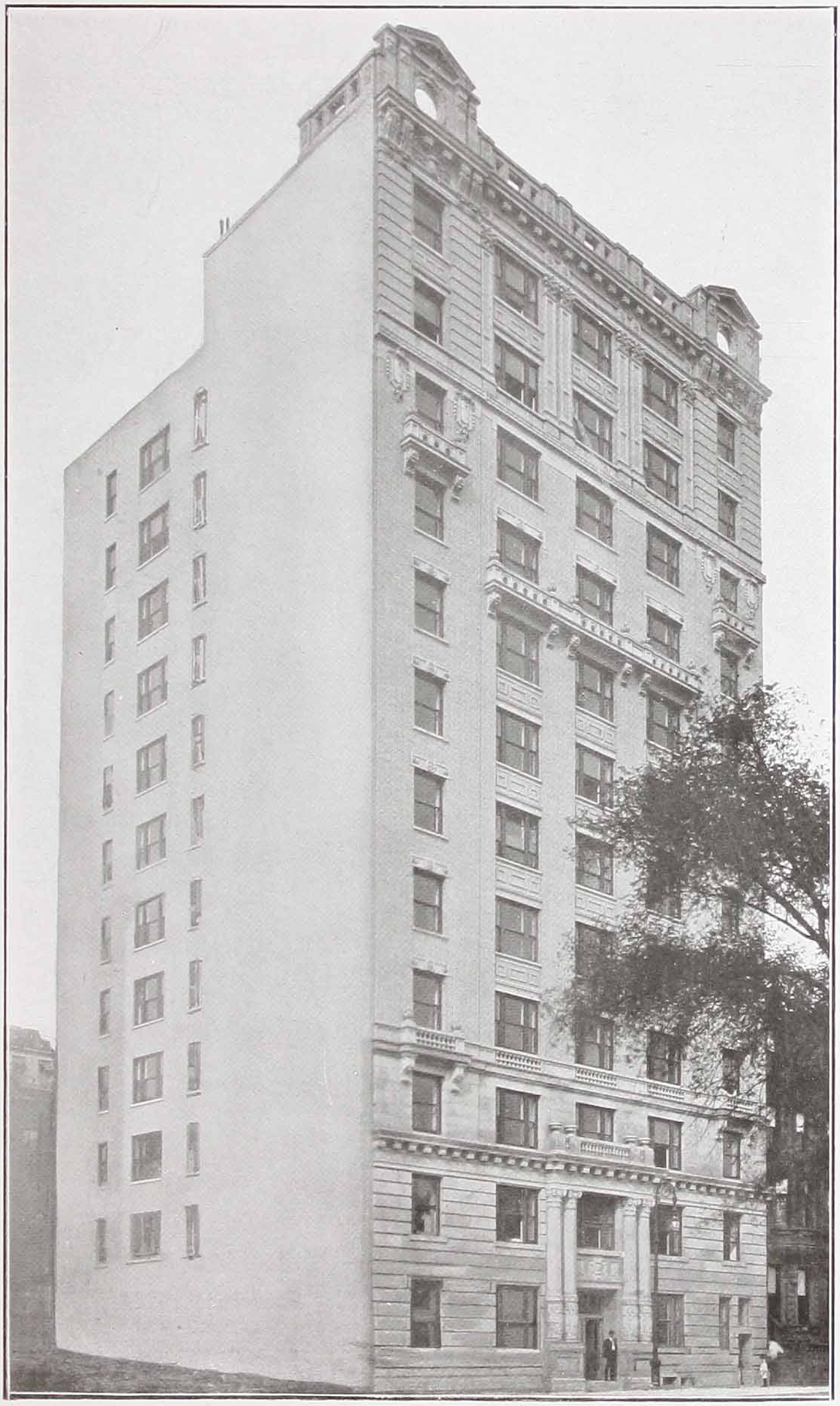


Ridgeley Apartments, Birmingham, Alabama.

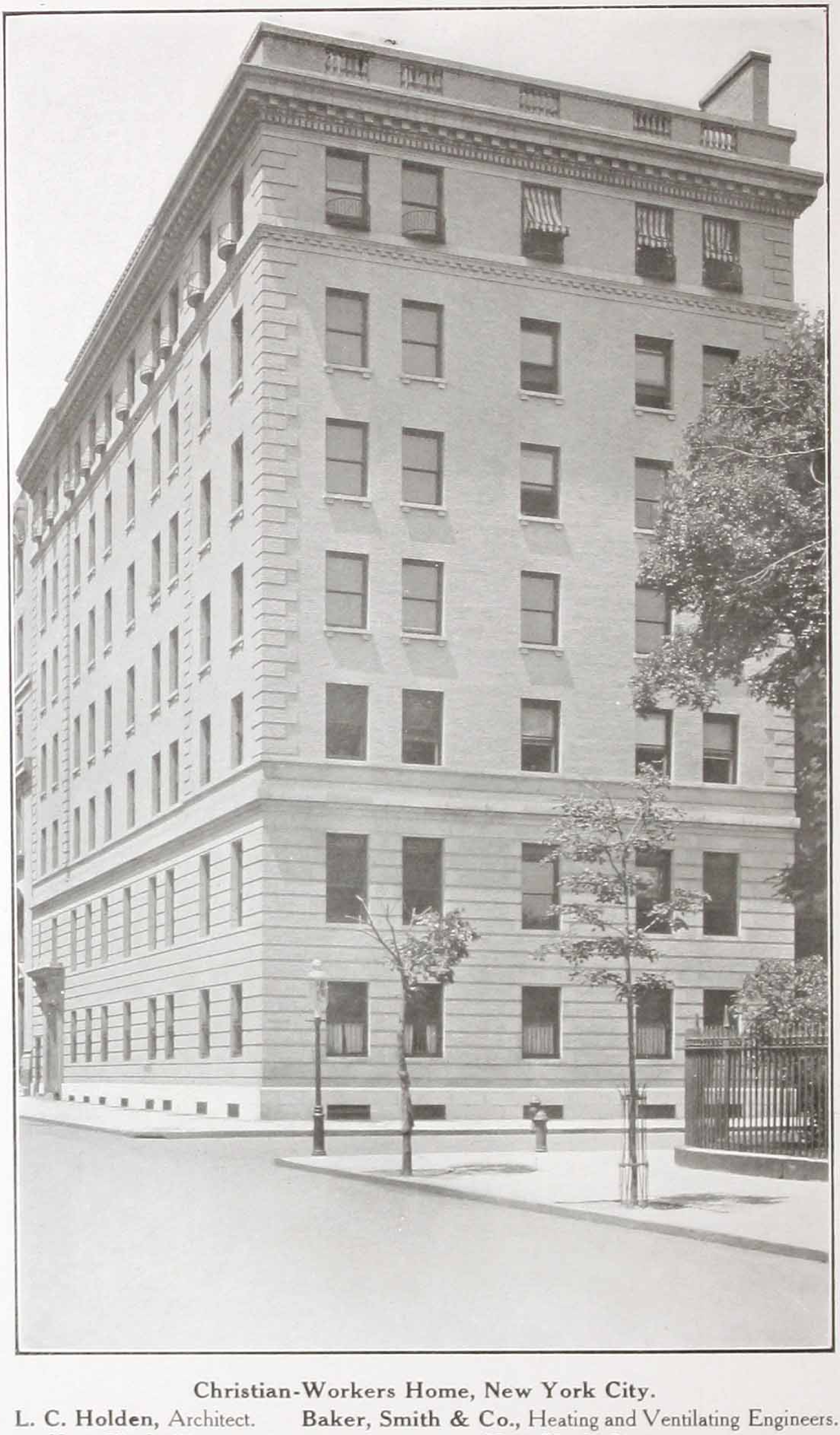
J. E. R. Carpenter, Architect.
New York City.

Mr. J. F. Musselman, Consulting Engineer.
New York City.

F. E. Newbery Elec. Co., Heating Contractors.
St. Louis, Mo.



McMorrow Apartments, New York City.
Neville & Bagge, Architects. **Baker, Smith & Co.,** Heating Engineers.
New York City. **New York City.**
Baker, Smith & Co., Heating Contractors, **New York City.**

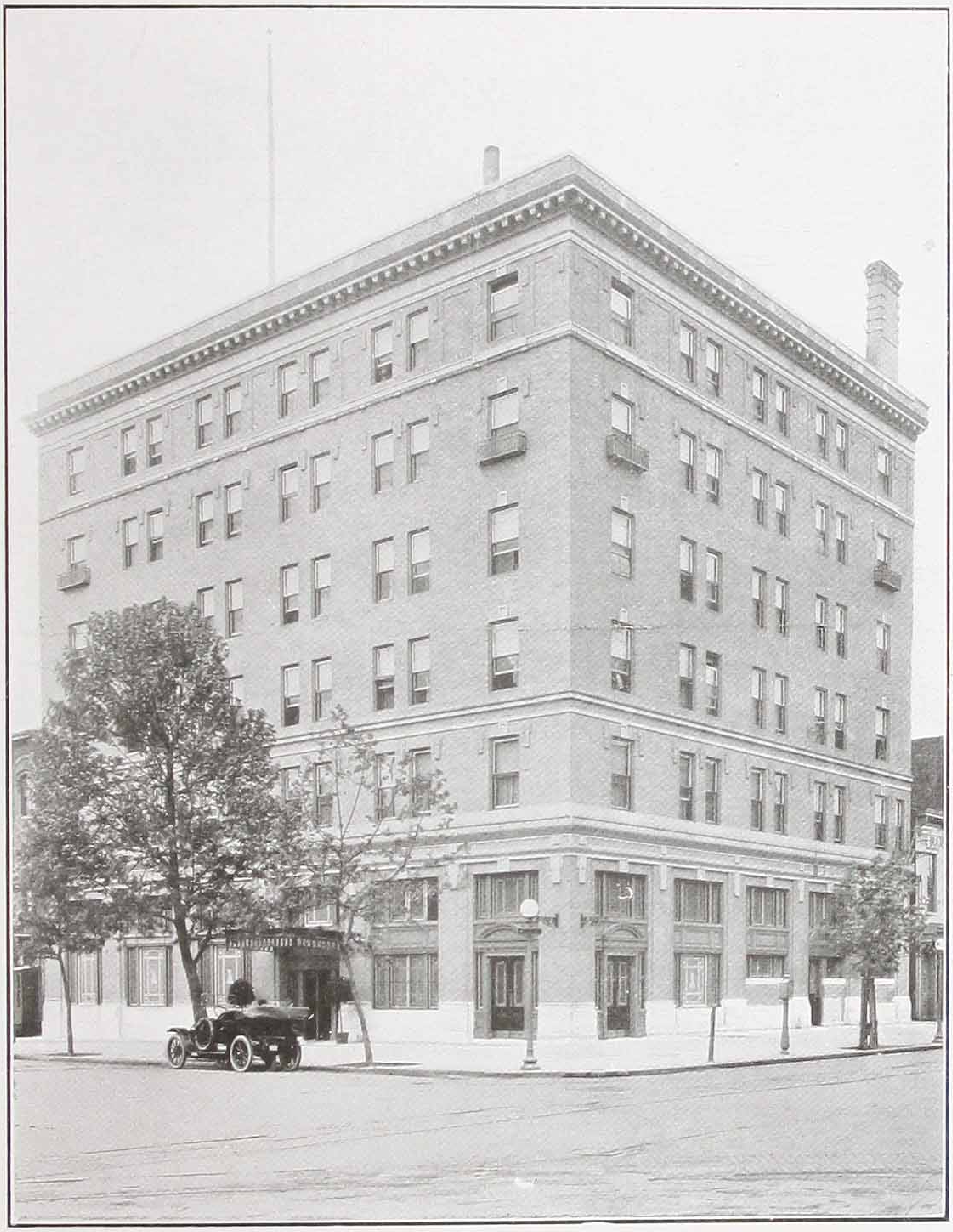


Christian-Workers Home, New York City.

L. C. Holden, Architect.
New York City.

Baker, Smith & Co., Heating and Ventilating Engineers.
New York City.

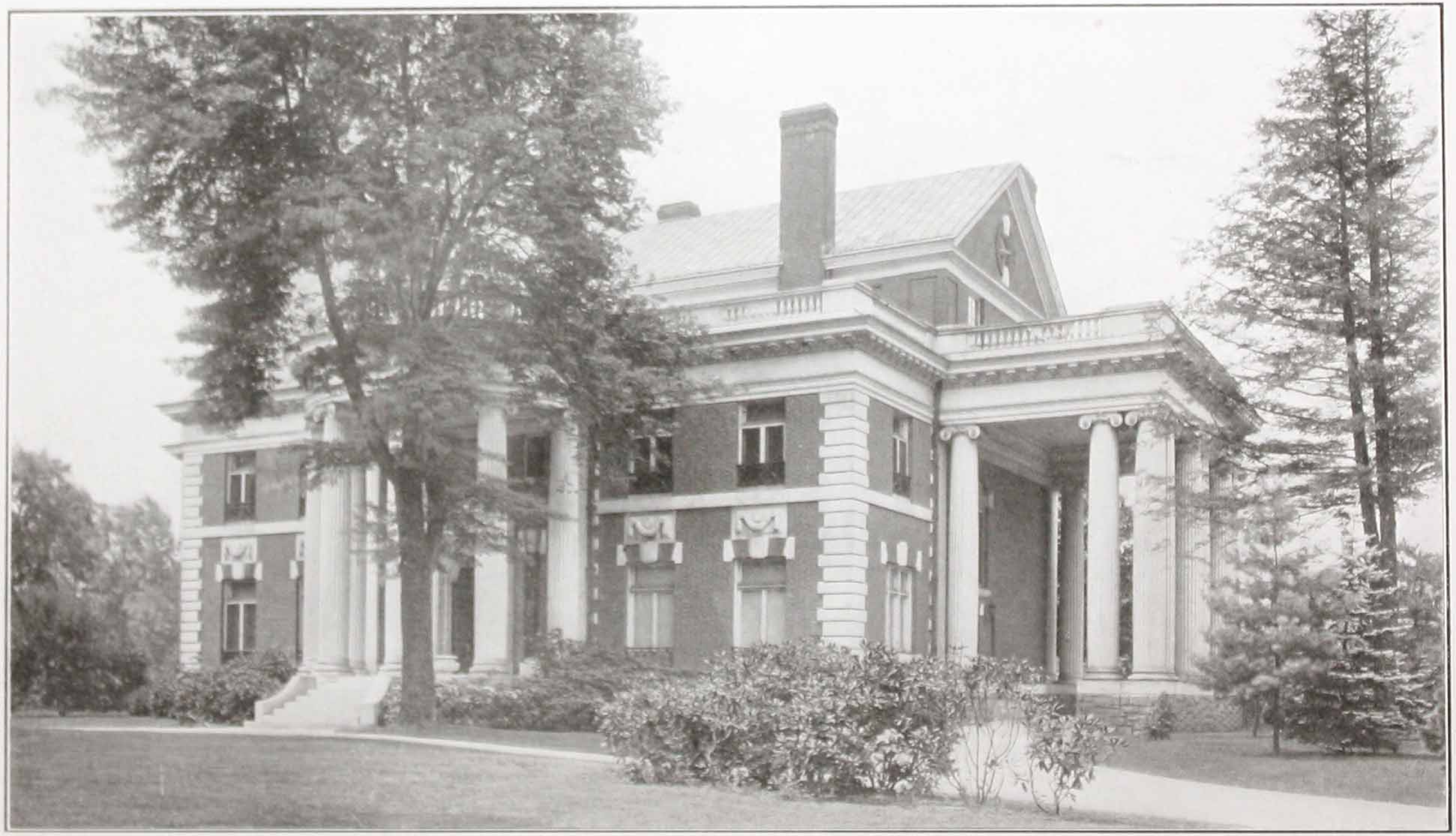
Baker, Smith & Co., Heating Contractors.
New York City.



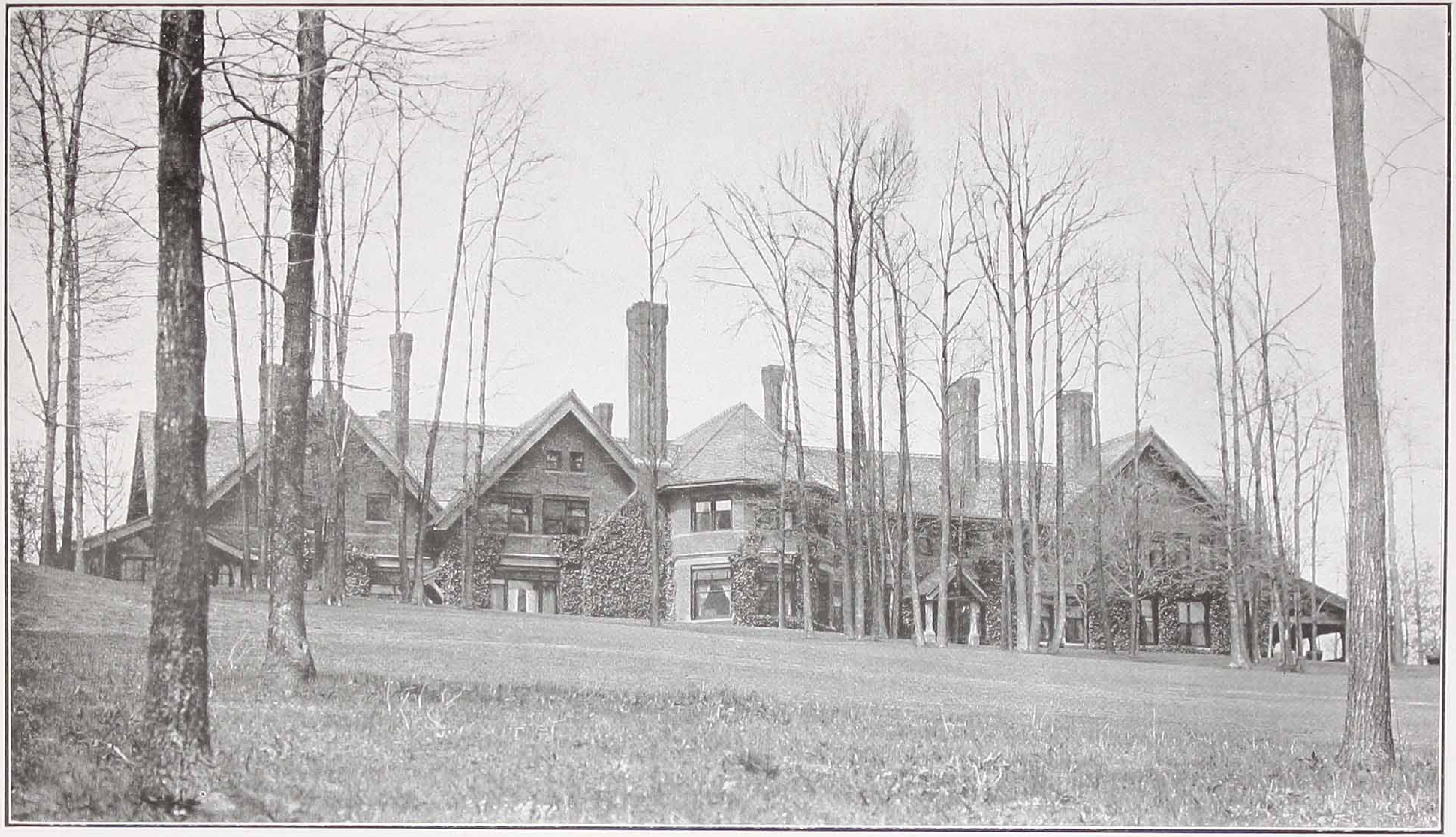
Hotel Harrington, Washington, D. C.

Rich & Fitzsimons, Architects. **Thos. W. Powers Eng. Co.,** Consulting Engineers.

Standard Engineering Co., Heating Contractors.
Washington, D. C.



The Hon. C. N. Fowler's Residence, Elizabeth, N. J.

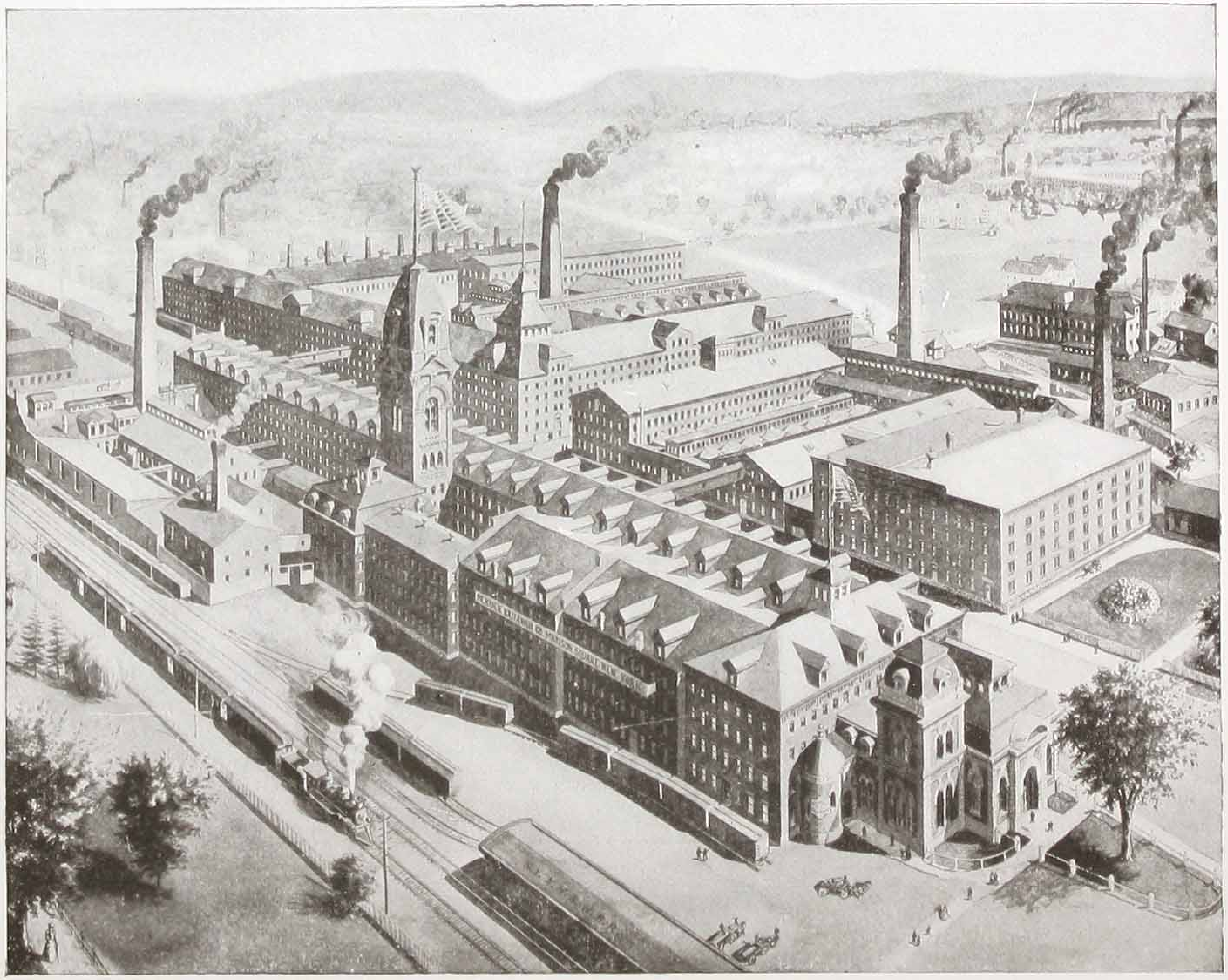


Mr. Payne Whitney's Residence, Manhasset, L. I.

M. S. Marckos Robertson, Architect.
New York City.

Baker, Smith & Co., Heating Contractors.
New York City.

Baker, Smith & Co., Heating and Ventilating Engineers.
New York City.



International Silver Co., Meridan, Conn.